JR 4

June 1983

INITIAL ASSESSMENT STUDY OF NAVAL WEAPONS STATION, CONCORD, CALIFORNIA

NEESA 13-013

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY

Port Hueneme, California 93043

092
09202 Desk copy

DISTRIBUTION

CNO (OP-45)
CHNAVMAT (04H2)
COMNAVFACENGCOM (112) (2 copies)
COMNAVSEASYSCOM (64121E)
CO WESTNAVFACENGCOM (114) (5 copies)
CO WPNSTA Concord (5 copies)
CO NAVOROSTA (OE) Indian Head

INITIAL ASSESSMENT STUDY
NAVAL WEAPONS STATION, CONCORD, CALIFORNIA

UIC:
N60036

Prepared by:

ECOLOGY AND ENVIRONMENT, INC.
120 Howard Street
San Francisco, California 93043

Contract No. N62474-82-C-8272

Initial Assessment Study Team Members

Gerald A. Strobel, Project Director
James B. Moore, Project Manager
Nancy J. Aungst, Socioeconomics Specialist
Gary M. Ellis, Environmental Engineer
George V. Gartseff, Public Health Specialist
Boyd N. Possin, Geohydrologist
Robert C. James, Ph.D., Toxicologist
Louis W. Adams, Ordnance/Chemical Engineer
Nancy A. Schiller, Senior Technical Writer
Jack M. Foran, Technical Writer

Prepared for:

NAVY ASSESSMENT AND CONTROL
OF INSTALLATION POLLUTANTS (NACIP) DEPARTMENT
Naval Energy and Environmental Support Activity (NEESA)
Port Hueneme, California 93043

Project Coordinators

Jeff Heath NEESA
Kent Adams NEESA
John Accardi NEESA

June 1983

Naval
Environmental
Protection
Support
Service

FOREWORD

The Navy initiated the Navy Assessment and Control of Installation Pollutants (NACIP) program in OPNAVNOTE 6240 ser 45/733503 of 11 September 1980 and Marine Corps Order 6280.1 of 30 January 1981. The purpose of the program is to systematically identify, assess, and control contamination of the environment resulting from past hazardous materials operations.

An Initial Assessment Study (IAS) was performed at the Naval Weapons Station, Concord, California, by a team of specialists from Ecology and Environment, Inc., (E & E). Further confirmation studies under the NACIP program were recommended at several areas at the activity. Sections dealing with significant findings, conclusions, and recommendations are presented in the earlier section of the report. The later technical sections provide more in-depth discussion on important aspects of the study.

Questions regarding the NACIP program should be referred to the NACIP Program Director, NEESA 112N, Port Hueneme, CA 93043, AUTOVON 360-3351, FTS 799-3351, or commercial (805) 982-3351.

Daniel L. Spiegelberg, LCDR, CEC, USN
Environmental Officer
Naval Energy and Environmental Support Activity

ACKNOWLEDGEMENTS

The Initial Assessment Study team commends the support, assistance, and cooperation provided by personnel at Western Division, Naval Facilities Engineering Command; Naval Energy and Environmental Support Activity; Ordnance Environmental Support Office; and especially Naval Weapons Station (NWS) Concord. In particular, the team gratefully acknowledges the outstanding effort provided by the following people, who participated in the successful completion of the study:

- David M. Sikes, NWS Concord.
- Jeffrey C. Heath and Kent D. Adams, Naval Energy and Environmental Support Activity.
- Robert W. Julian, Western Division, Naval Facilities Engineering Command.
- Pamela G. Clements, H.A. Dodohara, and Linda J. Lay, Ordnance Environmental Support Office.
- Dr. Dean C. Allard, Navy Historical Center, Operational Archives
- Dr. Elaine C. Everly, National Archives.

CONTENTS

			Page
Chapter	1.	Introduction	1-1
	1.1	Scope	1-1
	1.1.1	Authority	1-1
	1.1.2	NACIP Program	1-1
	1.2	Sequence of Events	1-1
	1.2.1	Designation	1-1
	1.2.2	Contract	1-1
	1.2.3	Correspondence	1-1
	1.2.4	Initial Site Visit	1-1
	1.2.5	Records Search	1-1
	1.2.6	On-Site Survey	1-1
	1.3	Report Recommendations	1-4
	1.3.1	Confirmation Study	1-4
	1.3.1.1	Verification Step	1-4
	1.3.1.2	Characterization Step	1-4
	1.3.1.3	Criteria	1-4
	1.3.1.4	Evidence	1-4
	1.3.1.5	Confirmation Study Ranking System	1-5
	1.3.2	Mitigating Actions	1-5
Chapter	2.	Significant Findings	2-1
	2.1	Introduction	2-1
	2.2	Tidal Area Sites	2-1
	2.2.1	Tidal Area Landfill (Site 1)	2-1
	2.2.2	R Area Disposal Site (Site 2)	2-1

CONTENTS (Continued)

			Page
	2.2.3	Kiln Site (Site 3)	2-6
	2.2.4	Allied Site A (Site 4)	2-6
	2.2.5	Allied Site B (Site 5)	2-6
	2.2.6	Coke Pile Site (Site 6)	2-9
	2.2.7	1944 Explosion - Docks (Site 7)	2-9
	2.2.8	1944 Explosion - Ryer Island (Site 8)	2-9
	2.2.9	Froid and Taylor Road Disposal Area (Site 9)	2-10
	2.2.10	Nichols Road Site (Site 10)	2-10
	2.2.11	Wood Hogger (Site 11)	2-10
	2.2.12	Port Chicago (Site 12)	2-10
	2.3	Inland Area Sites	2-11
	2.3.1	Burning Area (Site 13)	2-11
	2.3.2	Kinne Boulevard Wells (Site 14)	2-12
	2.3.3	Railroad Classification Yard (Site 15) ...	2-17
	2.3.4	Black Pit at Red Rock (Site 16)	2-17
	2.3.5	Building IA24 (Site 17)	2-24
	2.3.6	Building IA25 (Site 18)	2-24
	2.3.7	Seal Creek Disposal Area (Site 19)	2-24
	2.3.8	Old Homestead, Seal Creek (Site 20)	2-24
	2.3.9	Building 97 Fuel Tanks (Site 21)	2-24
	2.3.10	Area Around Building 7SH5 (Site 22)	2-24
	2.3.11	Inland Area Explosive Ordnance Disposal (Sites 23A and 23B)	2-25
	2.3.12	Ranges (Sites 24A and 24B)	2-25
	2.4	Additional Tidal Area Sites	2-25
	2.4.1	K-2 Area (Site 25)	2-25
	2.4.2	G-1 Area (Site 26)	2-27
	2.5	General Significant Findings	2-27
Chapter	3.	Conclusions	3-1
	3.1	Introduction	3-1

CONTENTS (Continued)

			Page
	3.2	Tidal Area Sites	3-1
	3.2.1	Tidal Area Landfill (Site 1)	3-1
	3.2.2	R Area Disposal Site (Site 2)	3-1
	3.2.3	Kiln Site (Site 3) and Allied Sites A and B (Sites 4 and 5)	3-1
	3.2.4	Coke Pile Site (Site 6)	3-2
	3.2.5	1944 Explosion - Docks (Site 7)	3-2
	3.2.6	1944 Explosion - Ryer Island (Site 8)	3-2
	3.2.7	Froid and Taylor Road Disposal Area (Site 9)	3-2
	3.2.8	Nichols Road Site (Site 10)	3-2
	3.2.9	Wood Hogger (Site 11)	3-2
	3.2.10	Port Chicago (Site 12)	3-2
	3.2.11	K-2 Area (Site 25)	3-2
	3.2.12	G-1 Area (Site 26)	3-5
	3.3	Inland Area Sites	3-5
	3.3.1	Burning Area (Site 13)	3-5
	3.3.2	Kinne Boulevard Wells (Site 14)	3-5
	3.3.3	Railroad Classification Yard (Site 15)	3-5
	3.3.4	Black Pit at Red Rock (Site 16)	3-5
	3.3.5	Building IA24 (Site 17)	3-6
	3.3.6	Building IA25 (Site 18)	3-6
	3.3.7	Seal Creek Disposal Area (Site 19)	3-6
	3.3.8	Old Homestead, Seal Creek (Site 20)	3-6
	3.3.9	Building 97 Fuel Tanks (Site 21)	3-6
	3.3.10	Area Around Building 7SH5 (Site 22)	3-6
	3.3.11	Inland Area Explosive Ordnance Disposal (Sites 23A and 23B)	3-6
	3.3.12	Ranges (Sites 24A and 24B)	3-6
Chapter	4.	Recommendations	4-1
	4.1	Introduction	4-1

CONTENTS (Continued)

			Page
	4.2	Tidal Area Landfill (Site 1), R Area Disposal Site (Site 2), Froid and Taylor Road Disposal Area (Site 9), and Wood Hogger Site (Site 11)	4-1
	4.3	Kiln Site (Site 3) Allied Sites A and B (Sites 4 and 5), Coke Pile Site (Site 6), K-2 Area (Site 25), and G-1 Area (Site 26)	4-1
	4.4	Burning Area (Site 13)	4-4
	4.5	Kinne Boulevard Wells (Site 14)	4-4
	4.6	Black Pit at Red Rock (Site 16)	4-5
	4.7	General Recommendations	4-5
Chapter	5.	Background	5-1
	5.1	General	5-1
	5.1.1	Location and Description	5-1
	5.1.2	Organization and Missions	5-5
	5.2	History	5-7
	5.3	Physical Features	5-9
	5.3.1	Climatology	5-9
	5.3.2	Topography	5-9
	5.3.3	Geology	5-10
	5.3.4	Soils	5-10
	5.3.5	Hydrology	5-10
	5.3.6	Migration Potential	5-14
	5.4	Biological Features	5-16
	5.4.1	Fauna	5-16
	5.4.2	Flora	5-22
	5.5	Adjacent Land Use	5-22
	5.6	Legal Actions	5-26
Chapter	6.	Activity Findings	6-1
	6.1	Introduction	6-1
	6.2	Ordnance Operations	6-1

CONTENTS (Continued)

			Page
	6.2.1	Ordnance Department	6-1
	6.2.1.1	Building 97	6-1
	6.2.1.2	Building 7SH5	6-1
	6.2.2	Weapons Quality Engineering Center	6-2
	6.2.2.1	Chemical Laboratory	6-2
	6.2.2.2	X-Ray Facilities	6-3
	6.2.2.3	Photography Laboratory	6-3
	6.2.2.4	Environmental Test Laboratory	6-3
	6.2.2.5	Materials Test Laboratory	6-4
	6.2.3	Segregation Facilities	6-4
	6.3	Support Operations and Tenants	6-4
	6.3.1	Safety Department	6-4
	6.3.2	Public Works Department	6-4
	6.3.2.1	Facilities Maintenance Division	6-7
	6.3.2.2	Transportation Division	6-8
	6.3.3	Coast Guard Port Safety Section	6-12
	6.3.4	Naval Regional Medical Branch Clinic	6-12
	6.3.5	Naval Regional Dental Branch Clinic	6-15
	6.3.6	Exchange Service Station	6-15
	6.3.7	Print Shop	6-15
	6.4	Radiological Operations	6-16
	6.5	Hazardous Materials Storage	6-16
	6.6	Waste Disposal	6-18
Chapter	7.	Bibliography	7-1
Appendix	A	Plant and Animal Species in the NWS Concord Area	A-1

TABLES

Table No.	Titles	Page
1-1	Listing of Government Agencies Contacted	1-3
2-1	Areas of Suspected Contamination, NWS Concord	2-2
2-2	Laboratory Analysis of Surface Soil Sample from Black Pit at Red Rock (Site 16)	2-23
2-3	Summary of Results of Surface and Composite Soil Samples Analysis, K-2 Area (Site 25)	2-28
4-1	Recommendations, NWS Concord	4-2
5-1	NWS Concord Acreage Summary	5-4
5-2	Predominant Soil Types at NWS Concord	5-13
5-3	Rare and Endangered Species of San Francisco Bay and Vicinity	5-21
6-1	Pesticides Commonly Used at NWS Concord	6-9
6-2	Hazardous Materials Commonly in Shop Use at NWS Concord	6-17
6-3	Coke Pile (Site 6) Analytical Results	6-39
6-4	Results of Sample Analysis at Allied Site A (Site 4)	6-41
6-5	Ordnance Items Disposed of at the Burning Area Site (13)	6-51

FIGURES

Figure No.	Titles	Page
1-1	Location of NWS Concord	1-2
2-1	Tidal Area Findings (Sites 1-12, 25, and 26)	2-7
2-2	Inland Area Findings (Sites 13 and 24B)	2-13
2-3	Inland Area Findings (Site 14)	2-15
2-4	Inland Area Findings (Site 15)	2-19
2-5	Inland Area Findings (Sites 16, 17, 18, 19, 20, 21, 22, 23B, and 24A)	2-21
2-6	Inland Area Findings (Site 23A)	2-26
3-1	Areas of Potential Contamination, Tidal Area (Sites 1, 2, 3, 4, 5, 6, 9, 11, 25, and 26)	3-3
3-2	Areas of Potential Contamination, Inland Area (Site 13)	3-7
3-3	Areas of Potential Contamination, Inland Area (Site 14)	3-9
5-1	NWS Concord, Inland and Tidal Areas	5-2
5-2	Pittsburg Radiographic Facility, NWS Concord	5-3
5-3	Chain of Command, NWS Concord	5-6
5-4	Geologic Cross-Section Showing Major Formations at NWS Concord	5-11
5-5	Location of Water Wells in Vicinity of NWS Concord	5-15
5-6	Biota in the Vicinity of NWS Concord	5-19

FIGURES (Continued)

Figure No.	Titles	Page
5-7	Existing Land Use, Tidal Area	5-23
5-8	Existing Land Use, Inland Area	5-24
6-1	Aerial View of the Tidal Area, Looking North	6-5
6-2	Spent Forklift Batteries, Building IA24	6-13
6-3	Aerial View of Tidal Area, Looking Northeast	6-19
6-4	Froid and Taylor Road Disposal Area (Site 9)	6-23
6-5	Froid and Taylor Road Disposal Area (Site 9), Looking South	6-25
6-6	Aerial View, Seal Creek Disposal Area (Site 19), Looking North	6-27
6-7	Old Homestead, Seal Creek (Site 20)	6-29
6-8	The Black Pit at Red Rock (Site 16)	6-31
6-9	Railroad Classification Yard (Site 15)	6-33
6-10	Coke Piles (Site 6), Looking North	6-37
6-11	Kiln Site (Site 3), Allied Sites A and B (Sites 4 and 5), K-2 Area (Site 25), and G-1 Area (Site 26)	6-40
6-12	Aerial View, Burning Area (Site 13), Looking Northeast	6-43
6-13	Burning Area (Site 13), Looking South From the Vicinity of the Fire Tower	6-45
6-14	Burning Area (Site 13), Looking East	6-47
6-15	Debris in the Burning Area (Site 13)	6-49

EXECUTIVE SUMMARY

An Initial Assessment Study (IAS) is the collection and evaluation of information on past operations which may indicate that pollutants have contaminated a site and would pose a potential hazard to human health or the environment. When contamination is suspected, analytical sampling is recommended to confirm or deny contamination. Recommendations are based on evidence obtained from archival records, personnel interviews, site inspections, and the analysis of samples.

Over 32 sites were investigated during the on-site phase of the IAS conducted at Naval Weapons Station (NWS) Concord in June of 1982. Of these, 25 sites were identified as significant, and 13 were determined to warrant further study under the NACIP program. The sites for which further investigation has been recommended are as follows:

Site 1: Tidal Area Landfill; used as a general disposal area from 1944 to 1979.

Site 2: R Area Disposal Site; used as a general ordnance scrap disposal area.

Site 3: Kiln Site; five acres of contaminated soils containing high levels of arsenic and lead; possibly coke filter materials.

Site 4: Allied Site A; soils contaminated with high levels of copper, cadmium, iron, zinc, arsenic, and lead.

Site 5: Allied Site B; soils contaminated with high levels of zinc, iron, and copper.

Site 6: Coke Pile Site; estimated 1,500 cubic yards of spent coke; some heavy metals and low pH at site.

Site 9: Froid and Taylor Road Disposal Area; used for the disposal of ordnance, scrap metal, and miscellaneous debris.

Site 11: Wood Hogger Site; pentachlorophenol (PCP) contaminated wood used as fill.

Site 13: Burning Area; used for munitions disposal for over 30 years.

Site 14: Kinne Boulevard Wells; contamination by unknown quantities of fuel oil and unidentified chemicals.

Site 16: Black Pit at Red Rock; apparent disposal area for solvents and paints.

Site 25: K-2 Area; soils contaminated with heavy metals (zinc and copper).

Site 26: G-1 Area; soils contaminated with lead and zinc.

The results of the confirmation study will be used to evaluate the necessity of conducting mitigating actions or cleanup operations.

CHAPTER 1. INTRODUCTION

1.1 SCOPE.

1.1.1 Authority. As directed by the Chief of Naval Operations (CNO), the Naval Energy and Environmental Support Activity (NEESA), in conjunction with the Ordnance Environmental Support Office (OESO), conducts studies and evaluates evidence indicating the existence of pollutants from on-station sites which may have contaminated an area and which may pose a health hazard to people located on or off the naval installation under investigation. The Navy Assessment and Control of Installation Pollutants (NACIP) program was initiated by OPNAVNOTE 6240 ser 45/733503 of 11 September 1980 and Marine Corps Order 6280.1 of 30 January 1981.

1.1.2 NACIP Program. The Initial Assessment Study (IAS) is the first phase of the NACIP program, the objective of which is to identify, assess, and control environmental contamination from past hazardous materials, storage, transfer, processing, and disposal operations.

1.2 SEQUENCE OF EVENTS.

1.2.1 Designation. Naval Weapons Station (NWS) Concord (see Figure 1-1) was designated for an IAS by CNO letter ser 451/397464 of 3 August 1982.

1.2.2 Contract. Ecology and Environment, Inc., (E & E) was awarded Navy Contract N62474-82-C-8272 for "Initial Assessment Studies at NAS Alameda, NSY Mare Island, and NWS Concord," effective 24 March 1982.

1.2.3 Correspondence. The Commanding Officer of Western Division, Naval Facilities Engineering Command, was notified of the impending study by NEESA by letter ser 587 dated 2 April 1982. The Commanding Officer, NWS Concord, was notified of the impending study by NEESA by letter ser 626 dated 9 April 1982.

1.2.4 Initial Site Visit. An initial visit was made to NWS Concord on 20 April 1982 by E & E team members and Mr. Jeffrey Heath, NEESA Engineer-in-Charge of the Contract, and Mr. John Accardi, also of NEESA. On 23 April 1982, Mr. Jeffrey Heath conducted the command briefing for NWS Concord personnel.

1.2.5 Records Search. Various government agencies were contacted for documents pertinent to the IAS. Table 1-1 is a listing of the agencies contacted.

1.2.6 On-Site Survey. The on-site phase of the IAS was conducted from 21 through 25 June 1982. Mr. Kent Adams served as the NEESA Project Coordinator for the NWS Concord study. In addition to record reviews, IAS team members conducted interviews with long-term and former NWS Concord employees. Ground and aerial tours of the installation were also made. Information presented in this report is not specifically referenced with a citation. Some information was

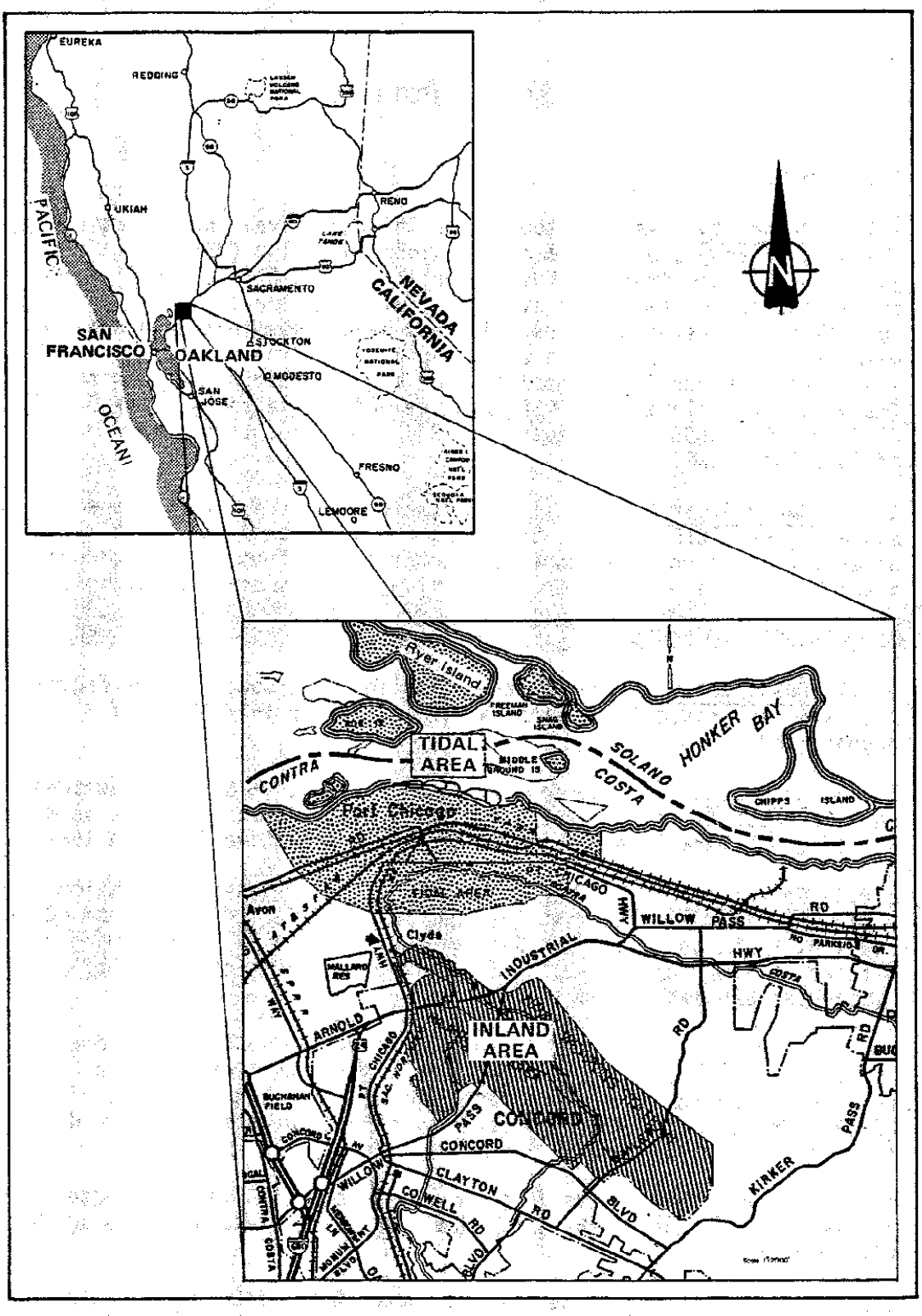


Figure 1–1 LOCATION OF NWS CONCORD

Table 1-1

LISTING OF GOVERNMENT AGENCIES CONTACTED

- NEESA
- NAVFAC Command Historian, Naval Construction Battalion Center, Port Hueneme, California
- Naval Sea System Command, Washington, D.C.
- Naval Facilities Engineering Command, Western Division, San Bruno, California: Planning Branch, Geotechnical Branch, Maintenance Division, Facilities Planning Department, Real Estate Branch, Natural Resources Management Branch, and Environmental Branch
- Ordnance Environmental Support Office, Naval Ordnance Station, Indian Head, Maryland
- Naval Surface Weapons Center, Dahlgren, Virginia
- National Cartographic Information Center, United States Geological Survey, Reston, Virginia
- Defense Mapping Agency, Washington, D.C.
- Department of Defense Explosive Safety Board, Alexandria, Virginia
- Navy Historical Center, Operations Archives, Navy Yard, Washington, D.C.
- Aerial Photography Field Office, Department of Agriculture, Salt Lake City, Utah
- EROS Data Center, Sioux Falls, South Dakota
- Environmental Protection Division, Chief of Naval Operations, Department of the Navy, Washington, D.C.
- National Archives: Navy and Old Army Branch and Cartographic Branch, Washington, D.C.; and National Archives at Suitland, Maryland
- California Department of Fish and Game, Yountville, California
- National Marine Fisheries Service, Tiburon, California
- United States Environmental Protection Agency, Region IX, San Francisco, California

received through interviews with individuals familiar with the activity. Information received was generally supported by one or more additional interviews, or by comparison with documented data. In particular, substantiation was obtained for interview data affecting IAS conclusions and recommendations.

1.3 REPORT RECOMMENDATIONS. Recommendations for possible courses of action are provided for disposal sites and spill areas located during the IAS. For sites posing a potential danger to human health or to the environment, confirmation studies under the NACIP program are recommended. For sites which warrant cleanup actions but do not warrant confirmation studies, mitigating actions are proposed.

1.3.1 Confirmation Study. The second phase of the NACIP program is the confirmation study. During confirmation studies, extensive sampling and monitoring is conducted to confirm or refute the existence of suspected contamination at sites identified during the IAS. If significant contamination exists, the confirmation study recommends the types of remedial actions to be implemented. The confirmation study is conducted in two steps: verification and characterization.

1.3.1.1 Verification Step. The purpose of the verification step is to verify the presence of migrating contamination and determine generalized site geohydrology. Efforts include short-term sampling of existing monitoring wells, sediment, soil, and surface water. The result of this phase is a general evaluation of contamination found, including geohydrological, health, safety, and regulatory aspects, and a recommendation as to whether or not to proceed with the characterization step.

1.3.1.2 Characterization Step. The characterization step, if required, is designed to determine specifics of groundwater movement, site geohydrology, and the levels and distribution of contamination, both vertical and horizontal, around contaminated sites. Efforts may include installation of monitoring wells, geophysical measurements, and quantitative analyses for selected contaminants. The result of this phase is a quantitative assessment of contamination sources and contaminant migration potential.

1.3.1.3 Criteria. A confirmation study is recommended only if the following circumstances exist:

1. Sufficient evidence exists to indicate the presence of contamination, and

2. Contamination poses a potential health or environmental threat on or off the naval facility.

If these criteria are not met, no further studies under the NACIP program are recommended in the IAS report.

1.3.1.4 Evidence. Evidence used in supporting recommendations for confirmation studies include written information from records, corroborated verbal reports from individuals knowledgeable of installation operations, and review of sampling analysis records.

1.3.1.5 Confirmation Study Ranking System. All known or suspected hazardous waste disposal sites identified by the IAS team were evaluated using a Confirmation Study Ranking System (CSRS) developed by NEESA for the NACIP program. The system is a two-step procedure for systematically evaluating a site's potential hazard to human health and the environment based on evidence collected during the IAS.

Step one of the system is a flowchart which eliminates innocuous sites from further consideration. Step two is a ranking model which assigns a numerical score, within a range of 0 to 100, to indicate the potential severity of a site. Scores are a reflection of the characteristics of the wastes disposed of at a site, contaminant migration pathways, and potential contaminant receptors on and off the installation. CSRS scores and engineering judgment are then used to evaluate the need for a confirmation study based on the criteria stipulated in Section 1.3. CSRS scores assigned to sites recommended for confirmation studies also assist Navy managers in establishing priorities for accomplishing the recommended actions.

A more detailed description of the CSRS is contained in NEESA Report 20.2-042.

1.3.2 Mitigating Actions. During the IAS, some areas may be located that do not warrant a confirmation study but do warrant an action of some kind by the installation. For example, a mitigating action could be proposed to clean up a contaminated area. The recommendations could relate to legal compliance, or improvement to an area or operation from an engineering standpoint and enhancement of human and physical environment.

CHAPTER 2. SIGNIFICANT FINDINGS

2.1 INTRODUCTION. Significant findings are defined as any evidence of past contamination that might represent a threat to human health or the environment. At least two indicators of contamination, i.e., interviews, documentation, or physical evidence, were necessary for the determination of significant findings. The significant findings are divided into two groups: sites in the Tidal Area, and sites in the Inland Area.

As shown on Figure 1-1, NWS Concord is divided into two areas, the Tidal Area and the Inland Area, separated by the town of Clyde, portions of the town of Concord, and hills. The two areas are joined by a railroad/highway corridor. Each geographical area is distinct not only in its physical setting, but also in its mission. Section 2.2 describes Tidal Area sites, while Section 2.3 describes Inland Area sites. Table 2-1 lists all the sites investigated during the survey.

2.2 TIDAL AREA SITES. The Tidal Area is the center of ammunition transshipment activities. In this area, both containerized and break-bulk munitions are received, inspected, and classified; held awaiting transportation; and outloaded. Various amounts of waste have been generated and disposed of in the Tidal Area since operations began in 1942. Two endangered species (the salt marsh harvest mouse, Reithrodontomys reviventris, and the California black rail, Laterallus jamaicensis coturniculus) as well as the figwort family of plants (several species of which are endangered) are located in the Tidal Area. No studies have been performed to determine if these species are threatened by the Tidal Area sites.

The following sections present the significant findings in the Tidal Area. These sites are shown on Figure 2-1.

2.2.1 Tidal Area Landfill (Site 1). The Tidal Area Landfill served as the major disposal area for NWS Concord from approximately 1944 to 1979. Household garbage from the base and surrounding communities was disposed of in the landfill. In addition, solvents, acids, paint cans, creosote-treated timbers, asphalt, concrete, asbestos, and ordnance materials, including inert munitions, were disposed of there. Shipboard wastes were also disposed of in the landfill. The landfill is approximately 100 acres in extent and has at least a five-foot depth of material. An estimated 33,000 tons of waste were buried in this area. The landfill was also used for the disposal of tritanol filler from a 750-pound general purpose bomb. Because of its extensive use for over 30 years, the Tidal Area Landfill contains the greatest variety of hazardous wastes of any disposal area on the station.

2.2.2 R Area Disposal Site (Site 2). From the late 1940s until about 1976, the tidal marsh area east of and parallel to Baker Road between the Segregation Area (also known as the R Area) and the Inert Storage Area was used for the disposal of materials generated during the segregation of conventional munitions returned from the Pacific. The tidal marsh area used as a disposal area has been named the R Area Disposal Site. The site is approximately 800 feet long, 10 feet wide, and at least five feet deep. No record exists of how much waste was

Table 2-1

AREAS OF SUSPECTED CONTAMINATION, NWS CONCORD

Area of Concern	Period of Operation	General Types of Waste Reportedly Disposed of or Spilled	Quantities and Specific Wastes
Tidal Area Landfill (Site 1)	1944 to 1979	Industrial and non-industrial	Estimated 33,000 tons of waste materials, including solvents, acids, paints, creosotes, asbestos, and ordnance, as well as household garbage and shipboard wastes
R Area Disposal Site (Site 2)	Late 1940s to approximately 1976	Industrial	Estimated 650 tons of waste materials, including paints, solvents, and inert ordnance materials
Kiln Site (Site 3)	Unknown	Heavy metals	About five acres of contaminated soils containing high levels of arsenic and lead; possibly coke filter materials
Allied Site A (Site 4)	Estimated 20 years	Heavy metals	About three acres of contaminated soils containing high levels of copper, cadmium, iron, zinc, arsenic, and lead
Allied Site B (Site 5)	Estimated 20 years	Heavy metals	About five acres of contaminated soils containing high levels of zinc, iron, and copper
Coke Pile Site (Site 6)	Estimated 20 years	Spent coke; heavy metals	Estimated 1,500 cubic yards of spent coke

Table 2-1 (Cont.)

Area of Concern	Period of Operation	General Types of Waste Reportedly Disposed of or Spilled	Quantities and Specific Wastes
[redacted]	1944	Unexploded ordnance	As late as 1959, munitions found on the bottom in the berthing area; quantities unknown
[redacted]	1944	Unexploded ordnance	Two buried boxcars of munitions, containing MK 7 incendiary bombs and MK 47 depth bombs
Froid and Taylor Road Disposal Area (Site 9)	1944 to 1979	Ordnance, scrap metal, and miscellaneous debris	Estimated 50 yards
[redacted] (Site 10)	Unknown; at least since 1962	Possibly spent coke	Five cubic yards
Wood Hogger (Site 11)	1968 to 1973	Possibly PCP-contaminated wood	Estimated 80,000 cubic yards
[redacted] (Site 12)	1930s to 1976	Unknown	Estimated to be insignificant
Burning Area (Site 13)	1944 to 1979	Powder, flares, napalm	Estimated 500,000 pounds of ordnance

Table 2-1 (Cont.)

Area of Concern	Period of Operation	General Types of Waste Reportedly Disposed of or Spilled	Quantities and Specific Wastes
Kinne Boulevard Wells (Site 14)	1960s to present	Fuel oil, chemicals	Alleged contamination of wells; quantities unknown
[redacted] (Site 15)	Not applicable	Methyl bromide vials and spent ordnance	Four 4-inch vials of methyl bromide; numerous casings
Black Pit at Red Rock (Site 16)	Evidently several years	Heavy metals, including titanium, magnesium, vanadium, aluminum, calcium, manganese, barium, cercium, chromium, rubidium, cobalt, and iron	An estimated 50 cubic yards of contaminated soils
Building IA24 (Site 17)	1950s to 1974	Acid, lead	An estimated 1,000 gallons of battery acid
Building IA25 (Site 18)	1950s to present	Paints, solvents	Approximately 1,000 gallons
Seal Creek Disposal Area (Site 19)	1950s (?) to present	Asphalt, construction debris, material washed in from off base	100 cubic yards

Table 2-1 (Cont.)

Area of Concern	Period of Operation	General Types of Waste Reportedly Disposed of or Spilled	Quantities and Specific Wastes
Old Homestead, Seal Creek (Site 20)	Unknown; presumed before 1943	Household debris	Estimated five cubic yards containing coffee pots, bed pans, old cans, and other inert household items
Building 97 Fuel Tanks (Site 21)	1970 to present	JP-5 rocket motor fuel	Estimated 500 gallons
Area Around Building 7SH5 (Site 22)	1950s to mid-1970s	Industrial	Estimated 500 gallons of solvents, cleaners, and paints throughout 20-year period
Inland Area EOD: 1959 EOD (Site 23A) and Eagle's Nest EOD (Site 23B)	1959 to 1973	Explosives	Less than one ton
Ranges: Pistol Range (Site 24A) and Aircraft Range (Site 24B)	1943 to present	Lead, ordnance	Less than 10 tons
K-2 Area (Site 25)	Estimated 20 years	Refinery wastes; coke debris from Kiln Site (Site 3)	About five acres of contaminated soils containing zinc, lead, and copper
G-1 Area (Site 26)	Estimated 20 years	Refinery waste	About six acres with visible sumps and distressed vegetation; zinc has been detected at site

disposed of at this site. However, it contains an estimated 650 tons of waste. Casings, cans, drums, and other ordnance waste are clearly visible both on the surface and beneath the water of the marsh.

2.2.3. Kiln Site (Site 3). The Kiln Site is one of three Navy-owned properties determined by past studies to have been contaminated, possibly by hazardous materials associated with the Allied Chemical Company facility located within the NWS Concord Tidal Area. The approximately five-acre site is located on NWS Concord property about 400 yards west of the Allied Chemical Company and immediately north of the Southern Pacific Railroad tracks. Until 1974, several containment structures were located at the site.

In February 1982, NWS Concord personnel collected two soil samples at the site. Analyses of these samples revealed arsenic (300 to 400 ppm) and lead (over 29,000 ppm). In addition, the existence of low but higher than background levels of tellurium and selenium in the soil samples suggest the presence of the same type of coke filter material at this site as is found elsewhere in the Tidal Area (see Section 2.2.4). On 10 September 1982 NWS Concord let a contract (No. N62474-82-M-D339) for the development of a cleanup plan for the Kiln Site.

2.2.4 Allied Site A (Site 4). Site A comprises a marshy area several acres in size adjacent to the northwest portion of the Allied property. Samples collected by the California Department of Fish and Game in the fall of 1976 showed contamination of marsh water due to low pH runoff, possibly from the Allied plant's hydrofluoric acid recycle system ponds and the alum mud and iron oxide that covers most of the northern portion of the property. Readings as low as 1.2 pH were measured in samples of runoff water taken during the study. Particularly high levels of contaminated runoff from the ponds have been noted during rainy weather; vegetation at the site is notably stressed during such periods.

In 1977, after conducting sampling of the soils in this area to determine the extent of contamination, Allied Chemical scraped approximately 7,800 cubic yards of contaminated soils at Site A and placed them behind a dike constructed along its northwest property line to control runoff.

In November 1980, NWS Concord personnel collected six soil samples from several areas of discolored deposits on the site. The results of these analyses showed high levels of copper (3,700 ppm), iron (39,700 ppm), zinc (10,100 ppm), arsenic (14 ppm), and lead (79 ppm) in almost all of the samples. In April 1981, NWS Concord personnel collected five soil samples from the Site A area near the Allied facility to determine the effectiveness of the company's state-ordered cleanup actions. The samples were analyzed for pH, cadmium, copper, and arsenic. All samples revealed significant levels of arsenic (360 ppm), cadmium (9 ppm), and copper (1,100 ppm) in the soil; one sample also showed a low pH value of 4.6.

2.2.5 Allied Site B (Site 5). Site B in the NWS Concord Tidal Area is contiguous to Site A, extending southward along the western

Figure 2-1

This detailed station map has been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

boundary of the Allied facility. As with Site A, Site B was determined to be contaminated with low pH runoff, possibly from the Allied facility, by the California Water Quality Control Board in 1976. As part of its 1977 cleanup program, Allied Chemical applied agricultural lime to the approximately eight acres of NWS Concord property that comprise Site B, and extended the dike constructed near Site A southward along its western boundary to prevent runoff into Site B. Soil samples collected in 1980 in an area of Site B near the southern limit of the Allied property (presumed to be an old railroad wash facility) revealed high levels of zinc (974 ppm), iron (67,800 ppm), and copper (185 ppm).

Two sites were added to the IAS report at the request of NWS Concord after the IAS effort had been completed. These sites, designated K-2 and G-1, are adjacent to the Kiln Site (Site 3) and Allied Sites A and B (Sites 4 and 5). The K-2 and G-1 sites are discussed in Sections 2.4.1 and 2.4.2.

2.2.6 Coke Pile Site (Site 6). The area has been documented to contain some heavy metals and a low pH. Existing data indicate that surficial contamination from the pile area is localized. The small gradient of the underlying groundwater, combined with the fairly impermeable soils at the site, suggest that contamination migration in the groundwater (which has never been used as a water supply in this area) might also be limited.

2.2.7 1944 Explosion - Docks (Site 7). At 10:17 p.m. on 17 July 1944 approximately three and one-half million pounds of explosives in the hold of a ship and in railroad boxcars on an adjoining pier detonated. Much of NWS Concord Tidal Area and the community of Port Chicago was destroyed. Hundreds of people lost their lives. As a result of this disaster, munitions that had not exploded or had undergone incomplete detonation were scattered throughout the Tidal Area in the vicinity of the docks and railroad car barricades.

During the investigation of the 1944 disaster, a Navy survey team attempting to determine the extent of the crater on the bottom of the berthing area conducted an intensive probe of the area. Many "steel obstructions" were found at 81 feet below the mean lower low water level. A number of unexploded munitions were found throughout the Tidal Area. As late as 1959, Explosive Ordnance Disposal (EOD) personnel, while diving to recover the body of a forklift operator who had driven off a ship, found and recovered munitions which were lying exposed on the bottom beneath the piers. Degraded munitions are occasionally found in the tidal marsh.

2.2.8 1944 Explosion - Ryer Island (Site 8). Sixteen boxcars were located on the pier at the time of the 1944 explosion. Two of the boxcars were blown into the bay by the initial explosion and were subsequently raised. The cargo of the cars, which consisted of AN-MK 47 or AN-MK 54 depth bombs and AN-M7 or AN-N7 incendiary clusters, was still blocked and braced. Documentary evidence indicates that the two boxcars were buried somewhere on "Ryder Island." There is no "Ryder Island" in the vicinity of NWS Concord. The IAS team believes the

boxcars were buried on Navy-owned "Ryer Island" (note: spelled without a "d") located north of the Tidal Area. Ryer Island is used as a duck club hunting area.

2.2.9 Froid and Taylor Road Disposal Area (Site 9). During a drive through the Tidal Area by the IAS team, a piece of ordnance was found on Froid Road near its intersection with Taylor Boulevard (see Figure 2-1). This piece of ordnance was later identified by EOD personnel as an expended five-inch white phosphorus rocket round. An investigation of the surrounding area revealed scrap metal and other debris in the tidal marsh adjacent to the intersection of the two roads. The area is subject to tidal action. Although no specific incidents of the disposal of hazardous materials were linked directly to this site, its association with sites 1, 2, and 11 makes it an area of concern.

2.2.10 Nichols Road Site (Site 10). A small isolated pile of dark reddish-brown material located at the side of Nichols Road in the Port Chicago area was brought to the attention of the IAS team by Public Works personnel. The pile of material had apparently been located there since the Navy acquired the property in 1965, and apparently was used as support material for a cattle loading ramp. In May 1982, Public Works personnel collected a grab sample of the material for heavy metals analysis. The laboratory results indicated a lead concentration only slightly higher than the levels of lead usually found in natural soils in the region. No other heavy metals were detected.

2.2.11 Wood Hogger (Site 11). Since 1969, dunnage and other wood scrap from Tidal Area operations have been reduced to chipped waste by the wood hogging operation. The chips were sold to the Fiberboard Company in Antioch, California, until approximately 1972. When a market for the chips could not be found, they were deposited as fill (see Figure 2-1) in a wetland adjacent to the hogger, and now comprise a volume approximately 20 acres in areal extent and over 10 feet in thickness. Some of the wood scrap came from ordnance shipped to or returned from Vietnam. Most of the ammunition shipping crates used by the Marines in Vietnam, and some of the shipping crates used by the Army, were treated with pentachlorophenol (PCP), a wood preservative which has since been identified as a significantly toxic substance. As a result, the wood chip disposal area probably contains some PCP-contaminated material from those materials that were not sold. The total amount of wood chipped at the wood hogger amounted to several hundred tons per day in 1967. This amount is representative of the period 1967-1972, during the height of the Vietnam conflict. The total amount of PCP-contaminated wood that may have been chipped and disposed of at the site has been estimated at 20 tons. This estimate is based on the total amount of munitions shipped from NWS Concord, as well as the amount of munitions returned to NWS Concord during retrograde operations.

2.2.12 Port Chicago (Site 12). The explosion of July 1944 caused extensive damage to the town of Port Chicago located to the south of the NWS Concord Tidal Area (see Figure 2-1). As a result, the Navy proposed land acquisition programs to remove the civilian population

from within the Explosive Quantity-Distance Separation Arcs of the ammunition loading piers. The Secretary of the Navy recommended to Congress that the existing facilities at NWS Concord be retained, and that all land and properties within a two-mile hazard zone be purchased, except the chemical plants. In 1967, the Navy received approval for the acquisition of 5,021 acres of land within a two-mile radius of the station's loading piers. The town of Port Chicago was subsequently demolished.

2.3 INLAND AREA SITES. The Inland Area at NWS Concord, obtained in 1943, serves several functions. Support, supply, public works, and administrative facilities are located in this area of the station. About 200 magazines capable of holding approximately 94,000 short tons of munitions are also located here. Barricaded sidings are present throughout the area. The Inland Area also serves as a weapons inspection and maintenance facility. A Weapons Quality Engineering Center (WQEC) containing laboratory testing and X-ray facilities is located in this area.

2.3.1 Burning Area (Site 13). From the late 1940s until approximately 1974, extensive use was made of an area south of the firewatch tower (Building IA42) as a burning area (see Figure 2-2). Building IA53, an unlined burn pit, measured 50 feet on each side and 30 feet deep. All types of ordnance items except projectiles were disposed of at this location. Thousands of MK 1 and MK 13 flares were burned off or buried in the burn pit. In addition, the powder from 40,000 five-inch rockets was burned off in the pit, as well as several thousand photoflash cartridges. Between 1967 and 1969, an estimated 500,000 pounds of explosives (both black and smokeless powder) were destroyed in this area, both within the pit and by open burning. The material remaining in the fire pit was reportedly disposed of in the Tidal Area Landfill (Site 1), or plowed under at the burning area. The area of the fire pit can still be distinguished by stressed vegetation.

This area has been leased for grazing for a number of years. In 1980, nine cows grazing on leased land in the vicinity of the burn area died of nitrite poisoning. There is no evidence available to the IAS team of ordnance being responsible for the cattle's death. This area is currently proposed for incorporation in the Tule elk range in the future.

In 1947, a "large quantity of FS smoke chemicals" (sulfur trioxide and chlorosulfonic acid) was disposed of at the burning area into a trench six to eight feet deep, four feet wide, and 25 to 30 feet long. The chemicals were removed from smoke generators picked up during retrograde operations from the Pacific. Degradation of these chemicals will produce sulfuric acid and hydrochloric acid, which could contaminate groundwater.

The burning area was also used for the disposal of small arms ammunition. A 12-foot cube steel container was used as a "popping oven" for everything up to 50-caliber machine gun and 20-millimeter cannon ammunition. Thermite generators were disposed of in the same area by igniting them and placing them into dumpsters filled with water.

Powder and other loose material from the ammunition ships were disposed of by open burning at the site. Approximately one pickup-truck load of these materials was collected for each off-loading operation, i.e., about 40 times per year during the years 1944 to 1974. Some powder was disposed of by mixing it with water and spreading the resulting slurry over the hillside. This practice was discontinued when a demonstration of smokeless powder burning caused the entire hillside to "rumble" for several minutes, as the now dry but not yet decomposed powder ignited during a particularly dry summer.

The burning area was also used as a firefighter training school. In 1966 or 1967, at least 35 napalm bombs were ignited in a ditch at the base of the hill. Up to five bombs at once were used. Public Works personnel picked up the slag for disposal in the Tidal Area Landfill (Site 1); however, remnants of the bombs can still be seen.

Vegetation in the burning area itself is depressed. The soil surface is sunken. Debris, some of which has a black crystalline surface attached, is plainly visible (see Figures 6-12, 6-13, 6-14, and 6-15 in Section 6 of this report).

The wells near Mallard Reservoir (described in Section 5.3.5) installed by the City of Concord in 1976 lie approximately two miles downgradient of the burning area.

2.3.2 Kinne Boulevard Wells (Site 14). Three water supply wells approximately 500 feet in depth and 24 inches in diameter are located along Kinne Boulevard (see Figure 2-3). These wells were taken out of operation in the early 1960s, when NWS Concord was hooked up to the regional surface water supply system. Several interviewees stated that, at that time, the pumps were pulled, steel baskets of rock were lowered part of the way down the casings, and the well tops were closed and covered over with concrete.

During the drought that occurred in California in the mid- to late-1970s, an attempt was made to determine whether or not the wells along Kinne Boulevard could be put back into operation. The concrete cap was removed from one of the wells. Public Works personnel reported that strong chemical odors issued from the well bore. No samples or other quantitative data were collected. However, it was decided that the well was not usable, and the well opening was again covered over with concrete. No attempt was made to open and check the other two wells. The strong chemical odors apparently lend support to the allegations regarding the use of the wells for the disposal of contaminated fuel oil and other chemicals when the wells were originally closed.

The City of Concord installed a number of wells in 1976 to supplement the town's primary water supply, Mallard Reservoir. Five of these wells are located adjacent to the reservoir; one, designated RD-3, is located approximately 2,500 feet downgradient from the farthest west of the three Kinne Boulevard wells.

If the Kinne Boulevard wells were fully cased when they were installed, it is possible that the contaminants alledgedly disposed of

Figures 2-2 and 2-3

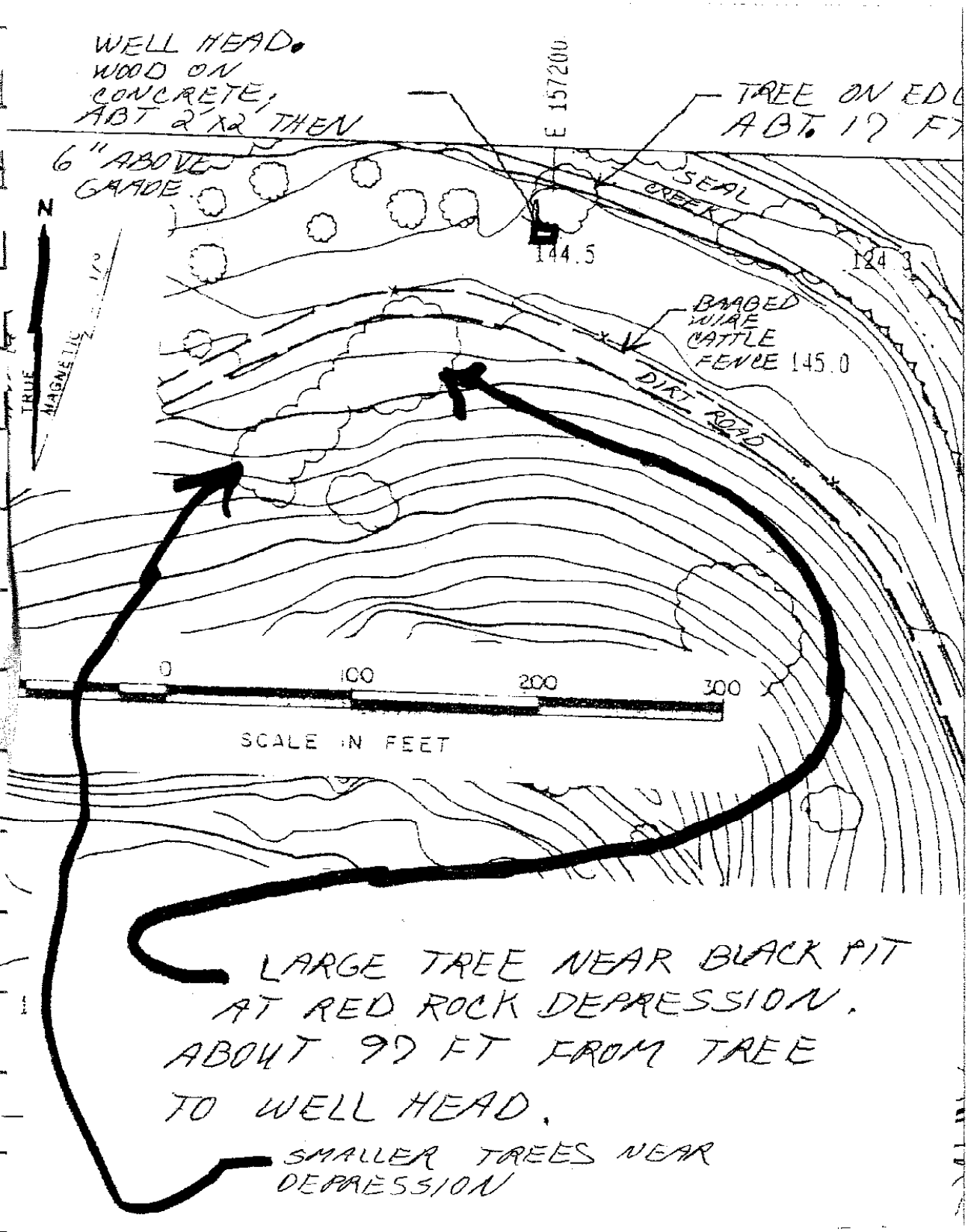
These detailed station maps have been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

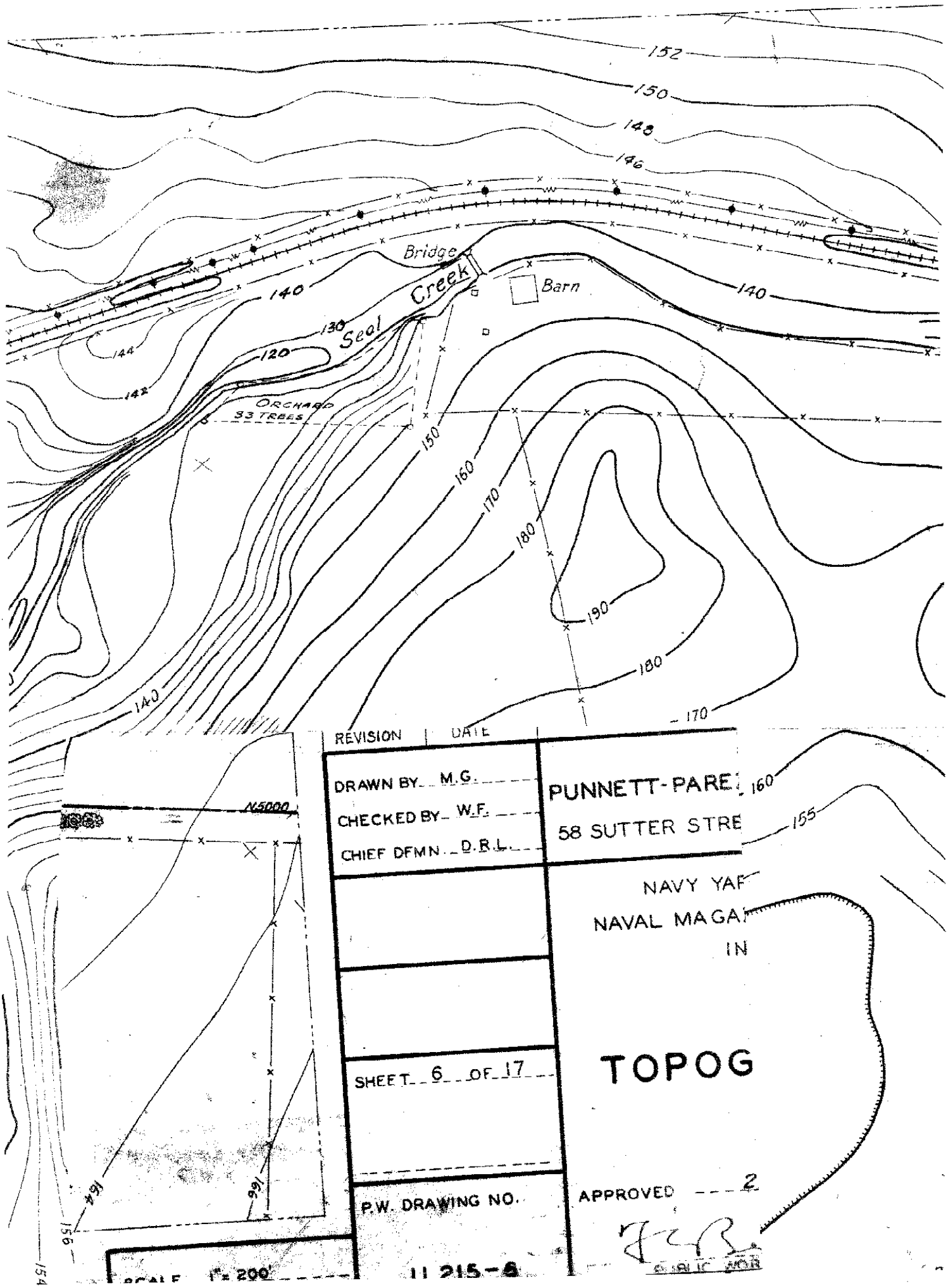
in the well never came into contact with the groundwater and would therefore not constitute a threat to the City of Concord Mallard Reservoirs wells. However, it is highly unlikely that the Kinne Boulevard wells were fully cased. The geomorphology of this region is such that the layers and lenses of highly permeable material (sand and gravel) are interspersed with layers of more impermeable material. The permeable layers contain the groundwater, and wells in this vicinity are screened to tap these permeable water-bearing layers that exist at varying depths in the Pleistocene alluvium. According to the record files of the California Department of Water Resources, well RD-3 at Mallard Reservoir is screened at the following depths: 82 to 102 feet, 150 to 175 feet, 180 to 185 feet, and 229 to 244 feet below the surface.

2.3.3 Railroad Classification Yard (Site 15). Two unbroken glass vials about four inches long and one inch in diameter containing the insecticide/rodenticide methyl bromide were found in 1982 along the embankment of the railroad classification yard (see Figure 2-4). In addition, several broken vials, also four inches long and one inch in diameter, were found in this area. These vials have been used at NWS Concord since 1954, primarily for the control of ground squirrels which cause damage to the waterproofing of ammunition igloos. It is not known how the vials came to be located on the embankment; no vials have been found elsewhere on the station. The unbroken vials were removed and disposed of. Shell casings (three-inch, 50-caliber, and 20-millimeter) were found washing out of the railroad bed fill material in the same general location. Unlike the methyl bromide vials, the casings appear to have been incorporated into the original fill that makes up the berms along the yard. Other IAS teams have reportedly found that old casings and shells were commonly used as fill material.

2.3.4 Black Pit at Red Rock (Site 16). During its survey, the IAS team found a pit between the Red Rock Disposal Area and the current clean fill borrow area (see Figure 2-5). No records exist concerning its use. The pit is approximately 15 feet long, 10 feet wide, and depressed as much as five feet below the ground level. The color of the soil is a very deep black. It is not loamy and supports only depressed, weedy vegetation. Bits of bone can be seen on the surface of the area. The pit, which is underneath a tree, is located about 15 yards uphill from an old well and within 100 yards of Seal Creek. While it might be argued that the pit contains the remnants of an old ranch house, its location does not support such a conclusion. Moreover, interviews with station personnel did not yield any information concerning the presence of a building at that location, though several other buildings dating from before the Navy acquired the area were readily identified by station personnel and were easily located by the IAS team.

Following the IAS ground survey, NWS Concord personnel took a surface sample from the site and submitted it for analysis. The results of that analysis are contained in Table 2-2. The common uses of the various chemicals that were found at the site are also shown in the table. The results of the analysis are indicative of the use of this site for disposal of waste generated at NWS Concord.


WELL HEAD.
WOOD ON
CONCRETE,
ABT 2'X2 THEN
6" ABOVE
GRADE.
E 157200
TREE ON EDG
ABT. 17 FT
SEAL
CREEK
144.5
124 3
N
TRUE
MAGNETIC
BARBED
WIRE
CATTLE
FENCE 145.0
DIRT ROAD
0
100
200
300
SCALE IN FEET
LARGE TREE NEAR BLACK PIT
AT RED ROCK DEPRESSION.
ABOUT 99 FT FROM TREE
TO WELL HEAD.
SMALLER TREES NEAR
DEPRESSION



REVISION | DATE	
DRAWN BY M.G.	PUNNETT-PARE
CHECKED BY W.F.	58 SUTTER STRE
CHIEF DFMN D.R.L.	
	NAVY YAF
	NAVAL MAGA
	IN
	TOPOG
SHEET 6 OF 17	
P.W. DRAWING NO.	APPROVED 2
SCALE 1"= 200'	11 215-6

Figures 2-4 and 2-5

These detailed station maps have been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

Table 2-2

LABORATORY ANALYSIS OF SURFACE SOIL SAMPLE
FROM BLACK PIT AT RED ROCK (SITE 16)

Parameter	Result (ppm)	Common Industrial Use
Titanium	2,800	Inorganic pigment; alloy for jet engines, aircraft frames, missile parts, and electronic parts
Magnesium	300,000	Alloys (missiles and space vehicles); pyrotechnics; batteries; optical mirrors
Vanadium	44	Catalyst; ultraviolet absorbent
Aluminum	420,000	Inorganic pigment; aircraft and missile parts; glass manufacturing
Calcium	110,000	Alloys; flame retardant
Manganese	330	Inorganic pigments; ferroalloys; glass manufacturing
Barium	340	Inorganic pigments; X-ray and vacuum tubes; pyrotechnics; glass manufacturing
Cercium	19	Glass manufacturing
Chromium	84	Inorganic pigments; catalyst; titanium dioxide manufacturing; glass manufacturing
Rubidium	39	Photovoltaic cells; special glass; vacuum tubes; catalyst
Cobalt	12	Alloys; catalyst; glass pigments; aircraft engines
Sodium	2,800	Photoelectric cells; catalyst
Potassium	2,000	Pyrotechnics; pigments
Iron	260,000	Alloys

Note: No pesticides or PCBs on the EPA priority pollutant list were found. Information is based on a single analysis.

Source: Environmental Research Group, Inc., Emeryville, California 94608, and NWS Concord personnel (10-29-82).

2.3.5 Building IA24 (Site 17). Battery acid was drained at the rate of about 20 gallons per day from forklift batteries into an outdoor "sump" located at the southeast corner of Building IA24 (see Figure 2-5) for at least 20 years prior to 1974. Based on interviews with station personnel it is assumed that the sump was probably just an earthen pit which was later filled. The area is now an overgrown field.

2.3.6 Building IA25 (Site 18). The IAS team was told that a burn pit and solvent disposal area existed at one time behind Building IA25 (see Figure 2-5); however, visual examination of the area revealed no environmental damage.

2.3.7 Seal Creek Disposal Area (Site 19). Seal Creek is a natural, intermittent surface drainage feature on NWS Concord Inland Area property. The creek flows from east to west, entering the Inland Area at its southeast boundary, flowing south and generally parallel to Kinne Boulevard, and discharging at the Concord Public Golf Course. As it traverses the station, the creek bed primarily lies three to 10 feet below the surrounding gradient.

According to available documentation, no direct discharges of wastes to Seal Creek have ever taken place at NWS Concord. However, some evidence of trash and rubble disposal at the creek's banks near Building 93 is visibly apparent (see Figure 2-5). An inspection by IAS investigators during the June 1982 survey revealed an eroding face of a debris fill adjacent to the creek bed. Materials observed in the eroding face as well as along the dry creek bed included tree cuttings; rubble; wood; two apparently empty, rusted 55-gallon drums; and other miscellaneous inert solid wastes.

No evidence of potentially hazardous materials buried near the creek was found. When questioned, employees familiar with the Seal Creek Disposal Area stated it had only temporarily served as a debris and rubble disposal area during the 1960s. Specific quantities, types, and the areal extent of buried wastes could not be determined.

2.3.8 Old Homestead, Seal Creek (Site 20). A gully filled with debris is located on the banks of the Seal Creek (see Figure 2-5). Coffee pots, bed pans, old cans, and other household items are located in the gully, which was apparently used by local ranchers as a disposal area before the land was acquired by the Navy. The IAS team determined that no hazardous waste had been disposed of in this area.

2.3.9 Building 97 Fuel Tanks (Site 21). JP-5 rocket motor fuel has been stored in underground tanks at Building 97 (see Figure 2-5). If fuel leaked, it would impact the groundwater. Guided Missile Department personnel interviewed stated that no indication of such leaks has ever been observed. They added that no rocket fuel is wasted at the building, as excess fuel is used in the building's heating system, per NAVFACINST 10340.6.

2.3.10 Area Around Building 7SH5 (Site 22). Small quantities (less than 200 gallons per year) of solvent and paint wastes generated in Building 7SH5 (a missile wings and fins repair facility) were disposed

of by emptying onto the ground around the building (see Figure 2-5). Visual inspection revealed no environmental effects.

2.3.11 Inland Area Explosive Ordnance Disposal (1959 EOD: Site 23A and Eagle's Nest EOD: Site 23B). Two areas other than the burn pit (Site 13) have been used as explosives ranges in the Inland Area. In the hills behind Building 5AT58 (Site 23A; see Figure 2-6) the EOD detachment conducted blows limited to 50 pounds of high explosives. These blows occurred from the late 1940s until roughly 1959, when complaints about the noise resulted in the range being shifted. For about 12 years, prior to shifting the range again in the 1960s to the Tidal Area, an area (Site 23B) was used near the eucalyptus grove which later was the nesting site for a pair of eagles (see Figure 2-5). A 50-pound explosive limit was also imposed on this area.

2.3.12 Ranges (Pistol Range: Site 24A and Aircraft Range: Site 24B). The station pistol range (Site 24A) located near Building IA57 has been in operation for over 25 years (see Figure 2-2). Approximately five years ago there was a project to replace the main firing bank. Due to the high lead content encountered and the associated costs to farm out the lead, berms were built over the original bank instead. Ammunition fired in this area ranged from small arms caliber to .50-caliber rounds. Building IA56 (see Figure 2-5) at the old airport was used for a few years as an aircraft target range (Site 24B), apparently for the bore sighting of wing guns. No information on amounts or durations of use could be found.

Two station personnel interviewed also stated that an anti-tank weapons firing range was located in the hills above the station. However, they could not agree if the impact area was located near the pistol range, with the firing point across the base near IA53, or if the impact area was near Building 97. No further information on the range could be obtained; accordingly, it was not considered a significant finding.

2.4 ADDITIONAL TIDAL AREA SITES. Following the completion of the IAS ground survey and submission of the first draft report, NWS Concord personnel requested that two additional sites be included in the report. Information on these sites, designated as the K-2 Area (Site 25) and G-1 Area (Site 26) (see Figure 2-1), is presented below.

2.4.1 K-2 Area (Site 25). The K-2 Area is located southwest of the Kiln Site (Site 3), but is separated from this site by the Southern Pacific Railroad. A culvert connects the two areas. The K-2 Area is adjacent to the western boundary of the G-1 Area (Site 26), and is bounded on the south by the tracks of the Atchison Topeka and Santa Fe Railroad.

A small stream traverses both the ESI Chemical Company grounds and the G-1 Area before passing under the Southern Pacific Railroad tracks and emptying into the tidal area marsh. The small stream that traverses the ESI grounds and G-1 Area used to run under the Southern Pacific Railroad tracks onto the Kiln Site, where it often puddled up. However, the culvert under the tracks became plugged, and the stream

Figure 2-6

This detailed station map has been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

established a new outlet to the west of the Kiln Site and K-2 Area. Reportedly, ESI Chemical Company at one time dumped waste into the creek, which could have resulted in the contamination. The K-2 Area varies in elevation from 14.5 feet in the southwest corner to 6.2 feet in the northeast corner. Several spots devoid of vegetation are present on the site. While no direct cause for these bare spots can be established, it is possible the vegetation was stressed by the contamination in the area.

In November 1982, NWS Concord personnel had an analysis performed of surface and composite (to six-inch depth) soil samples. The samples were taken by NWS Concord personnel in October 1982. A summary of the results of the analysis is shown in Table 2-3. Significant levels of copper (3,600 ppm), zinc (93,000 ppm), arsenic (760 ppm), and lead (5,200 ppm) were found.

2.4.2 G-1 Area (Site 26). The G-1 Area was owned by Getty Oil Company. Bounded on the north and east by the Southern Pacific Railroad, on the south and east by the Atchison Topeka and Santa Fe Railroad, and on the west by the K-2 Area, the triangular site is approximately six acres in size. A small stream traverses the site from south to northwest. The same stream traverses ESI Chemical Company property, and drains into the tidal area marsh after crossing the K-2 Area. Several sections of the G-1 Area are devoid of vegetation. Several abandoned sumps (also devoid of vegetation) are located on the site. During the years the site was owned by the Getty Oil Company, a refinery was located here.

In October 1982, NWS Concord personnel took soil samples for analysis. The only significant findings were from the sample designated G1-1, which was taken in the bottom of a sump. Significant levels of lead (150 ppm) and zinc (1,100 ppm) were found.

2.5 GENERAL SIGNIFICANT FINDINGS. NWS Concord has received its water from the East Bay Municipal Utilities District, but has undertaken to tie into the Contra Costa District. Groundwater from the Kinne Boulevard wells and numerous other smaller wells at one time constituted the primary source of water for the base. As the drought of 1976 showed, these wells may be needed by NWS Concord. The town of Concord installed a number of wells after the 1976 drought to supplement Mallard Reservoir; these wells are located downgradient within one mile of the Inland Area. Their locations are shown on Figure 5-5 in Section 5 of this report.

The Inland Area is home to a herd of Tule elk, which is listed by the State of California as an endangered species. A pair of golden eagles maintained a nesting site in the Inland Area until their nesting tree was toppled by a storm in the winter of 1981/82. Two endangered species, the California black rail (Laterallus jamaicensis coturniculus), and the salt marsh harvest mouse (Reithrodontomys raviventris), as well as the figwort family of plants (many species of which are endangered), have been found in the Tidal Area. However, no adverse impacts to these endangered species have been reported as the result of the Tidal Area sites. In addition, Suisun Bay supports extensive sports fishing and some commercial fishing, and the area directly offshore from NWS Concord is used by the California Department of Fish and Game for a salmon spawning study.

Table 2-3

SUMMARY OF RESULTS OF SURFACE AND COMPOSITE SOIL SAMPLES ANALYSIS, K-2 AREA (SITE 25)

Sample	Type	Parameters (ppm)			
		Copper	Zinc	Arsenic	Lead
K2-1	Surface	920	27,000	17	5,200
K2-2	Composite	230	930	35	500
K2-3	Surface	100	190	760	230
K2-4	Surface	1,100	36,000	56	5,200
K2-5	Composite	3,600	93,000	91	1,300
K2-15	Unknown	260	5,300	9.2	610

Note: Samples were taken generally from southeast to northwest, i.e., sample K2-5 was taken 198 paces west and 10 paces north of K2-1.

Source: Environmental Research Group, Inc., Emeryville, California 94608 (11-30-82).

CHAPTER 3. CONCLUSIONS

3.1 INTRODUCTION. Professional judgment on the part of the IAS team was the prime determinant in concluding that a site represented a potential threat to human health or the environment and, as such, warrants further action under the NACIP program. The IAS team was assisted in reaching these conclusions by use of the NEESA-developed CSRS (see Section 1.3.1.3). Of the 26 sites identified, 13 were evaluated as sites of potential contamination. A discussion of each of the 26 sites investigated is given below.

3.2 TIDAL AREA SITES. Of the 14 sites in the Tidal Area (discussed below), 10 were evaluated as areas of potential contamination (see Figure 3-1). These sites are the Tidal Area Landfill (Site 1), R Area Disposal Site (Site 2), Kiln Site (Site 3), Allied Sites A and B (Sites 4 and 5), Coke Pile Site (Site 6), Froid and Taylor Road Disposal Area (Site 9), Wood Hogger Site (Site 11), K-2 Area (Site 25), and G-1 Area (Site 26).

3.2.1 Tidal Area Landfill (Site 1). The Tidal Area Landfill has received about 33,000 tons of household garbage, waste solvents, acids, paints, creosote-treated lumber, asphalt, asbestos, and ordnance materials over a 30-year period. Because it is located in a tidal area, the landfill represents a threat to the environment through the migration of contaminants to the bay. Two endangered species located in the Tidal Area marsh (the California black rail, Laterallus jamaicensis coturniculus, and the salt marsh harvest mouse, Reithrodontomys raviventris), as well as the figwort family of plants (many species of which are endangered), may be threatened by this site. Further study under the NACIP program is warranted. (Note: Because of their physical proximity and for greater cost-effectiveness, sites 1, 2, 9, and 11 should be studied together.)

3.2.2 R Area Disposal Site (Site 2). The R Area was used as a disposal site for paints, solvents, and ordnance materials for nearly 30 years, and contains an estimated 650 tons of waste or more. The general disposal of household garbage also occurred at this location. The proximity of the disposal area to the bay and its location partially underwater in a tidal marsh may threaten the two endangered species located in the Tidal Area: the California black rail (Laterallus jamaicensis coturniculus), and the salt marsh harvest mouse (Reithrodontomys raviventris), as well as the figwort family of plants (many species of which are endangered). Further study of Site 2 under the NACIP program is warranted, to be undertaken in conjunction with sites 1, 9, and 11.

3.2.3 Kiln Site (Site 3) and Allied Sites A and B (Sites 4 and 5). The presence of contaminated coke filter material at the Kiln Site (Site 3) represents a threat to animal and plant life in the area.

Soils and deposits of materials in Site A (Site 4) and Site B (Site 5) contain high levels of various heavy metals and, in some cases, low pH. These deposits represent a potential threat to aquatic biota from contamination by toxic substances in rainfall runoff or tidal waters. Further investigation under the NACIP program is warranted. For

greater cost-effectiveness, sites 3, 4, 5, 6, 25, and 26 should be studied together. The K-2 Area (Site 25) and G-1 Area (Site 26) lie within the drainage pattern of sites 3, 4, and 5. While no direct link between these sites has been established, further investigation or remedial action at any of the five sites should be evaluated in terms of their physical proximity.

3.2.4 Coke Pile Site (Site 6). The two coke piles have been demonstrated to be a source of contamination and could pose a potential threat to the endangered species in this area. It has been concluded that further study under the NACIP program is warranted, to be undertaken in conjunction with sites 3, 4, 5, 25, and 26.

[redacted] EOD personnel at NWS Concord have determined that the munitions located on the bottom of the berthing docks and in the marsh do not threaten human health or the endangered species in the area. Further investigation under the NACIP program is not warranted.

[redacted] EOD personnel at NWS Concord have determined that the boxcars reportedly buried on Ryer Island do not constitute a threat to human health or the environment. Further investigation under the NACIP program is not warranted.

3.2.7 Froid and Taylor Road Disposal Area (Site 9). Contamination in the area may threaten the endangered species located in the tidal marsh. Further study of this site is warranted under the NACIP program, to be undertaken in conjunction with sites 1, 2, and 11.

[redacted] Since sampling has shown no significant contamination at this site, it has been concluded that the Nichols Road material does not pose a significant threat to the environment and that further study under the NACIP program is not warranted.

3.2.9 Wood Hogger (Site 11). It has been concluded that this site may threaten human health and the environment. The site warrants further study under the NACIP program, to be undertaken in conjunction with sites 1, 2, and 9.

[redacted] Because Port Chicago was a small, non-industrial town, it is highly unlikely that any threat to the environment exists from the razing of the town or from any residual materials in the town. As such, further study under the NACIP program is not warranted.

3.2.11 K-2 Area (Site 25). The sampling and analysis conducted by NWS Concord personnel have confirmed the presence of heavy metals and other contaminants in the K-2 Area. The proximity of the site to the tidal marsh and its endangered species constitutes a threat to the environment. Further investigation under the NACIP program is warranted. Such studies should be conducted in conjunction with the recommended studies for Site 25, and should be combined with the studies at sites 3, 4, 5, and 6 for greater cost-effectiveness.

Figure 3-1

This detailed station map has been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

3.2.12 G-1 Area (Site 26). Significant levels of contamination by zinc and lead have been found at the G-1 Area. The proximity of the site to the tidal marsh and its endangered species constitutes a threat to the environment. The drainage patterns in the area are such that sites 3, 4, 5, and 25 could be further contaminated by migration of contaminants from this site. Further investigation of the site under the NACIP program is warranted. Such studies should be coordinated with the studies at sites 3, 4, 5, 6, and 25.

3.3 INLAND AREA SITES. Of the 12 sites in the Inland Area, three were determined to be areas of concern: the Burning Area (Site 13), the Kinne Boulevard Wells (Site 14), and the Black Pit at Red Rock (Site 16). The Inland Area sites are discussed below.

3.3.1 Burning Area (Site 13). The burning area (see Figure 3-2) could be a threat to cattle grazing on the leased land and could constitute a threat to the endangered Tule elk should this area be included in their range. In addition, the burning area could be a threat to the City of Concord drinking water wells should use of these wells significantly increase in the future. The City of Concord Mallard Reservoir wells are located some 14,000 feet from the burning area site. With groundwater movement at an average rate of 26 feet per year (see Section 5.3.6), the distance any contaminants would have migrated is 1,040 feet, with 1942 used as the base year. At this rate, the contaminants would reach the wells in the year 2480, unless significantly increased pumping of the Mallard Reservoir wells were to occur. The increased hydraulic gradient created by this pumping would increase the rate of groundwater movement, and subsequent migration of contaminants. Further investigation of this site under the NACIP program is warranted.

3.3.2 Kinne Boulevard Wells (Site 14). Chemical odors were detected in the one well that was opened in the 1970s (see Figure 3-3). Quantities of fuel oil and other unidentified substances reportedly were disposed of in the three wells. Depending on well construction, it is possible that the contaminants have never come in contact with the flowing groundwater. However, if contaminants have come into contact with groundwater, the downgradient Mallard Reservoir wells would be affected if increased use of these wells were to occur. While there is no immediate threat, the suspected presence of chemicals in the wells warrants further study under the NACIP program.

3.3.3 Railroad Classification Yard (Site 15). The presence of methyl bromide vials has been satisfactorily explained, and seems to be an isolated event. The vials have been removed from the site. The presence of shell casings and cartridges can be explained if it is assumed they were used as fill, reportedly a common practice on other bases. No further action under the NACIP program is warranted.

3.3.4 Black Pit at Red Rock (Site 16). The sampling and analysis of the surface soil from this site indicate that it was used for the disposal of material generated at NWS Concord, particularly paints, pigments, and other chemicals. The most probable explanation is that plating wastes, paints, or solvents were disposed of here in the past. The site lies within 100 yards of Seal Creek; contaminants from this

site could migrate to the creek. Further investigation under the NACIP program is warranted.

3.3.5 Building 1024 (Site 17). Groundwater near the building may be contaminated with lead and low pH from battery casings. The low pH has probably been neutralized through contact with the soil; the lead has probably been bound to the soil and is migrating no further. The absence of any groundwater use in the immediate area leads to the conclusion that further study under the NACIP program is not warranted.

3.3.6 Building IA25 (Site 18). No evidence of contamination from Building IA25 could be ascertained. No further action under the NACIP program is warranted.

3.3.7 Seal Creek Disposal Area (Site 19). The filled area adjacent to Building 93 and on the north bank of Seal Creek appears to contain inert solid wastes. No documentation exists regarding downstream water quality problems associated with the burial site. The Seal Creek Disposal Area does not appear to be a source of hazardous material discharges into the creek. Further study under the NACIP program is not warranted.

3.3.8 Old Homestead, Seal Creek (Site 20). The gully on the banks of Seal Creek was apparently used as a disposal area by local ranchers prior to the Navy obtaining the property in 1943. No hazardous materials were disposed of at this site. Further study under the NACIP program is not warranted.

3.3.9 Building 97 Fuel Tanks (Site 21). Guided Missile Department personnel have never noted significant losses of JP-5 fuel in the tanks at Building 97. Further study under the NACIP program is not warranted.

3.3.10 Area Around Building 7SH5 (Site 22). It is likely that some disposal and spillage of solvents, paints, and other wastes around Building 7SH5 did occur. Because the amounts of wastes generated at the building were small, and because on-base disposal at the Tidal Area Landfill (Site 1) was available for large quantities of accumulated wastes, it is suspected that any local waste disposal was limited to the occasional emptying of small containers. Further study under the NACIP program is not warranted.

3.3.11 Inland Area Explosive Ordnance Disposal (1950 EOD, Site 23A) and Eagle's Nest EOD, Site 23B). The limitations placed on the amounts of explosives disposed of at the two Inland Area EOD sites, combined with their relatively short-term use, lead to the conclusion that further study under the NACIP program is not warranted.

3.3.12 Ranges (Pistol Range, Site 24A and Aircraft Range, Site 24B). The station pistol range (Site 24A) berm does contain a significant amount of lead; however, the berm has been recapped and the lead is in metallic (slug) form, thereby reducing any chance of migration into the groundwater. No threat to groundwater use in the area exists. The aircraft range (Site 24B) similarly presents little threat to human health or the environment. Further study under the NACIP program is not warranted.

Figures 3-2 and 3-3

These detailed station maps have been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

CHAPTER 4. RECOMMENDATIONS

4.1 INTRODUCTION. Recommendations are provided for contaminated sites identified during the IAS. For sites posing a potential danger to human health or to the environment, confirmation studies under the NACIP program are recommended. For sites which warrant cleanup actions but do not warrant confirmation studies, mitigating actions are proposed. Five confirmation studies involving 13 sites have been recommended (see Table 4-1). Sites 1, 2, 9, and 11 have been grouped together because of their physical proximity and to achieve greater cost-effectiveness during the confirmation study, as have sites 3, 4, 5, 6, 25, and 26.

4.2 TIDAL AREA LANDFILL (SITE 1), R AREA DISPOSAL SITE (SITE 2), FROID AND TAYLOR ROAD DISPOSAL AREA (SITE 9), AND WOOD HOGGER SITE (SITE 11)

Groundwater monitoring wells: None.

Type of samples: Surface water and sediment (verification study).

Number of samples: Three surface water samples; three sediment samples.

Testing parameters: Nitrates, lead, copper, mercury, arsenic, pentachlorophenol (PCP), polyaromatic hydrocarbons (PAHs), total organic halogens (TOX), creosote.

Remarks: Surface water grab samples and sediment samples (three each) should be taken in the marshy area of sites 1, 2, 9, and 11 for the verification study.

4.3 KILN SITE (SITE 3), ALLIED SITES A AND B (SITES 4 and 5), COKE PILE SITE (SITE 6), K-2 AREA (SITE 25), AND G-1 AREA (SITE 26).

Groundwater monitoring wells: None; contamination has been established.

Type of samples: Soil and surface water.

Number of samples: Estimated 80 each, depending on grid pattern.

Testing parameters: Zinc, copper, lead, cadmium, chromium, selenium, tellurium, arsenic, pH, soil resistivity.

Remarks: Although the six contamination areas in the NWS Concord Tidal Area adjacent to the Allied Chemical Company plant and Getty Oil Refinery site have been considered separate sites, they all represent areas contaminated by wastes generated in the past by industrial processes. The proximity of the sites to each other, combined with the common types of contaminants found at each, indicate that they represent a widespread area of contamination. A confirmation study should include the use of a grid sampling system on all six sites to allow for an accurate characterization of the areal extent of

Table 4-1

RECOMMENDATIONS, NWS CONCORD

Site Number	Site Name	CSRM Score	Confirmation Study					
			Verification (One-Time Study)			Characterization (First-Year Effort)		
			Number of Soil Samples	Number of Water Samples	Testing Parameters	Number of Wells	Number of Samples	Testing Parameters
013-1, 013-2, 013-9, and 013-11	Tidal Area Landfill, R Area Disposal Site, Froid and Taylor Road Disposal Area, and Wood Hogger Site	23 (Highest score among sites)	Three sediment samples	Three surface	Organics, TOX, heavy metals, pentachlorophenol (PCP), creosote	Remedial actions may be based on verification studies		
013-3, 013-4, 013-5, 013-6, 013-25, and 013-26	Kiln Site, Allied Sites A and B, Coke Pile Site, K-2 Area, and G-1 Area	30 (Highest score among sites)	Estimated 80 (Depending on grid pattern)	Estimated 80	Heavy metals, arsenic, pH, soil resistivity	Remedial actions may be based on verification studies		
013-13	Burning Area	24	Eight soil samples	Surface water if present	TNT, tetryl, mercury, lead, arsenic, and others (see text)	Eight	One each per quarter	As indicated by verification study

Table 4-1 (Cont)

Site Number	Site Name	CSRM Score	Confirmation Study					
			Verification (One-Time Study)			Characterization (First-Year Effort)		
			Number of Soil Samples	Number of Water Samples	Testing Parameters	Number of Wells	Number of Samples	Testing Parameters
013-14	Kinne Boulevard Wells	17	--	Discrete samples at representative depths from each of the three wells	EPA priority pollutants; oil and grease	Dependent on verification study	Dependent on verification study	As indicated by verification study
013-16	Black Pit at Red Rock	16	Three soil samples as found in bore holes	One water sample, if water found	Titanium, magnesium, vanadium, aluminum, calcium, manganese, barium, cercium, chromium, rubidium, cobalt, and iron	Remedial action dependent on verification		

contaminants. Soil and surface water samples should be collected within each grid sector and analyzed for lead, mercury, cadmium, chromium, copper, selenium, tellurium, arsenic, zinc, and pH. The sampling program should produce enough data to support the development of a map identifying isopleths of equal contamination, and establish the migration (if any) of contaminants onto these sites from the Allied Chemical Company plant and the ESI Chemical Company site.

4.4 BURNING AREA (SITE 13).

Groundwater monitoring wells: Eight in characterization study.

Type of samples: Soil samples; surface water as present; groundwater and core samples as indicated.

Number of samples: Eight soil samples; surface water grab samples.

Testing parameters: TNT, tetryl, mercury, methylaminoanthraquinone, hexachlorobenzene, HV Orange B, copper, lead, arsenic, strontium, nitroglycerin, nitrate (saltpeter).

Remarks: Soil samples from eight separate locations should be taken to a depth of 36 inches, with a composite sample of soil from depths zero to six inches, 18 to 24 inches, and 30 to 36 inches analyzed for the testing parameters. If surface water is present in the stock ponds downgradient (to the northeast) of the site, a grab sample should be taken and analyzed. If the verification study indicates contamination, eight groundwater monitoring wells should be installed. Cores taken during the installation of the wells should be examined by the on-site geologist, and groundwater samples should be taken and analyzed as appropriate. Initial samples should be taken after the wells are developed and analyzed. Sampling frequencies can be determined after the initial analysis, but should be roughly quarterly.

4.5 KINNE BOULEVARD WELLS (SITE 14).

Groundwater monitoring wells: None.

Type of samples: Air, groundwater, non-aqueous liquids.

Number of samples: Variable, see remarks. Estimated not to exceed 12.

Testing parameters: EPA priority pollutants, oil and grease.

Remarks: The well that was opened in the late 1970s should be re-opened and an attempt made to obtain discrete water (or other liquid) samples at representative well depths. Special emphasis should be placed on the discrete sampling of liquid phases other than water. An aliquot should be taken from each sample to make up a composite, which should be analyzed for all EPA priority pollutants. Based on this analysis, a contaminant parameter list should be prepared and each individual sample analyzed accordingly.

It may be difficult to acquire the water samples, since a rock-filled steel basket was reportedly lowered into each well to block access from the top. If the static fluid level is above the basket, the liquids here should be sampled first and an attempt made to remove the basket entirely, whereupon the remainder of the liquid column should be sampled. Once the basket is removed and the well sampled, a caliper log and a resistivity log should be run to determine the depth to which the casing extends. If the basket is above the water level and is impossible to remove, an air sample should be taken from the wells and analyzed for EPA volatile priority pollutant content.

If the results of this initial investigation confirm the presence of significant contaminant concentrations, the other wells should also be opened and similarly tested. If there is evidence that contaminants from any of the wells are in direct contact with the surrounding groundwater flow systems, an appropriate hydrogeological testing program should be developed to determine the nature and extent of the contaminant plume. The specifications for such a program cannot be defined at the present time, since there is insufficient information available to properly define the scope of the problem.

4.6 BLACK PIT AT RED ROCK (SITE 16).

Groundwater monitoring wells: None.

Type of samples: Soil; groundwater, if found.

Number of samples: Three.

Testing parameters: Titanium, magnesium, vanadium, aluminum, calcium, manganese, barium, cercium, chromium, rubidium, cobalt, iron.

Remarks: Samples should be taken to a depth of 36 inches or more, depending on findings. Samples can be taken by hand auger. Depth of penetration of contaminants should be ascertained. If the contamination is more than surficial (12 inches or less), an additional sampling effort should be conducted between the Black Pit and Seal Creek to determine potential migration.

4.7 GENERAL RECOMMENDATIONS. All sites recommended for confirmation studies under the NACIP program, or for mitigative activity of any kind, should be designated on base maps as areas of interest. Sites 7 and 8 should also be designated on base maps. The sites should be entered into the facility Master Plan with a description of the proposed confirmation studies or mitigative actions. Expansion of the Tule elk range into the area around Site 13 should be delayed until the confirmation study for the site has been completed.

CHAPTER 5. BACKGROUND

5.1 GENERAL.

5.1.1 Location and Description. NWS Concord is located in the north-central portion of Contra Costa County in the San Francisco Bay Area of California. It is approximately 30 miles northeast of San Francisco and has, as part of its boundary, Suisun Bay on the north. The station is bordered on the south and west by the City of Concord, which has a population slightly in excess of 100,000 residents.

NWS Concord encompasses over 12,819 acres of land consisting of three land holdings: the Tidal and Inland Areas near the City of Concord, linked by a narrow Navy-owned rail and road corridor, and a radiography facility located at Pittsburg, California (see Figures 5-1 and 5-2).

The 7,630-acre Tidal Area is divided between mainland and islands as shown in Table 5-1. All but a few hundred of the 7,630.56 acres are covered by the Explosive Quantity-Distance Separation Arcs generated by the three explosives handling piers. The piers and almost all of the other facilities in the Tidal Area are located on the original property of the Naval Magazine, Port Chicago. The other facilities include a barge pier, a 525-rail car barricaded siding complex, two rail holding yards, facilities for ammunition segregation and transfer, and other warehouses and support buildings. Navy-owned Tidal Area property includes six islands in Suisun Bay: Freeman, Ryer, Snag, and Roe islands, and the two islets which make up the Seal Islands. These islands account for a total of 1,571 acres. Approximately 3,233 acres in the Tidal Area are leased out for agricultural purposes. Seven hundred and forty acres on the offshore islands are leased out to duck hunting clubs.

The Inland Area, which is separated from the Tidal Area by a range of hills not owned by the Navy, encompasses approximately 6,208 acres. A Navy-owned road and rail line link the two areas. Almost 85% of the Inland Area is covered by Explosive Quantity-Distance Separation Arcs generated by a number of storage magazines and production facilities. Three roads cross the Inland Area: State Route 4, Willow Pass Road, and Bailey Road. The Contra Costa Canal also crosses the Inland Area. The largest single land use is ammunition storage, which is accommodated in five magazine groups and two groups of barricaded railroad sidings. Various production facilities, a Weapons Quality Engineering Center (WQEC), and the station's administrative complex are also located in the Inland Area. In addition, the station maintains restrictive easements on land in the hills to the east.

The radiography facility located approximately six miles east of the Tidal Area at Pittsburg, California, encompasses 3.34 acres of property. The facility was part of the former United States Army Pacific Ordnance Steel Foundry. NWS Concord has title to 1.68 acres of the property; the remaining 1.24 acres are an easement from the United States Steel Corporation for an access road. The facility is similar to the WQEC X-ray facility located in the Inland Area.

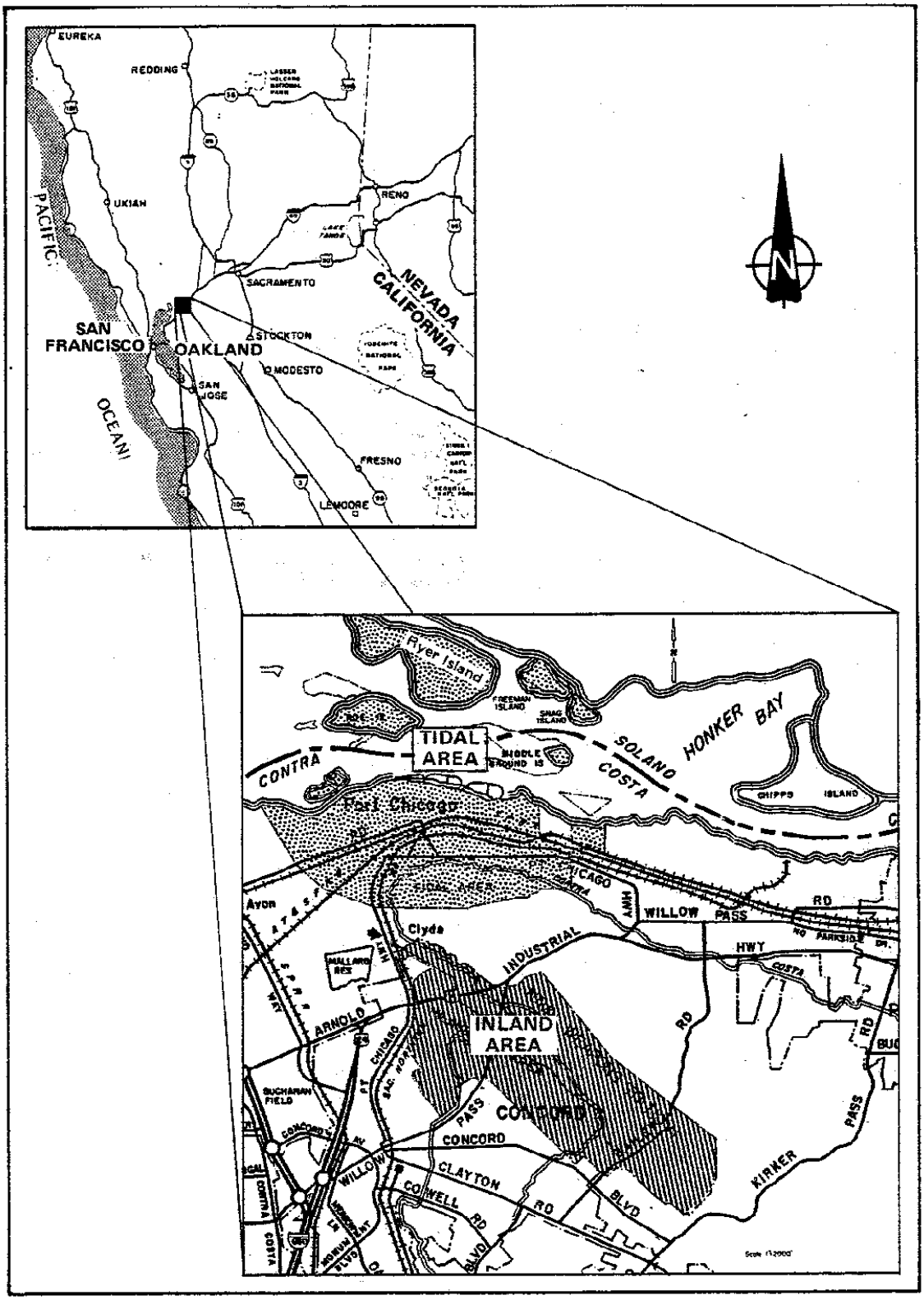


Figure 5–1 NWS CONCORD, INLAND AND TIDAL AREAS

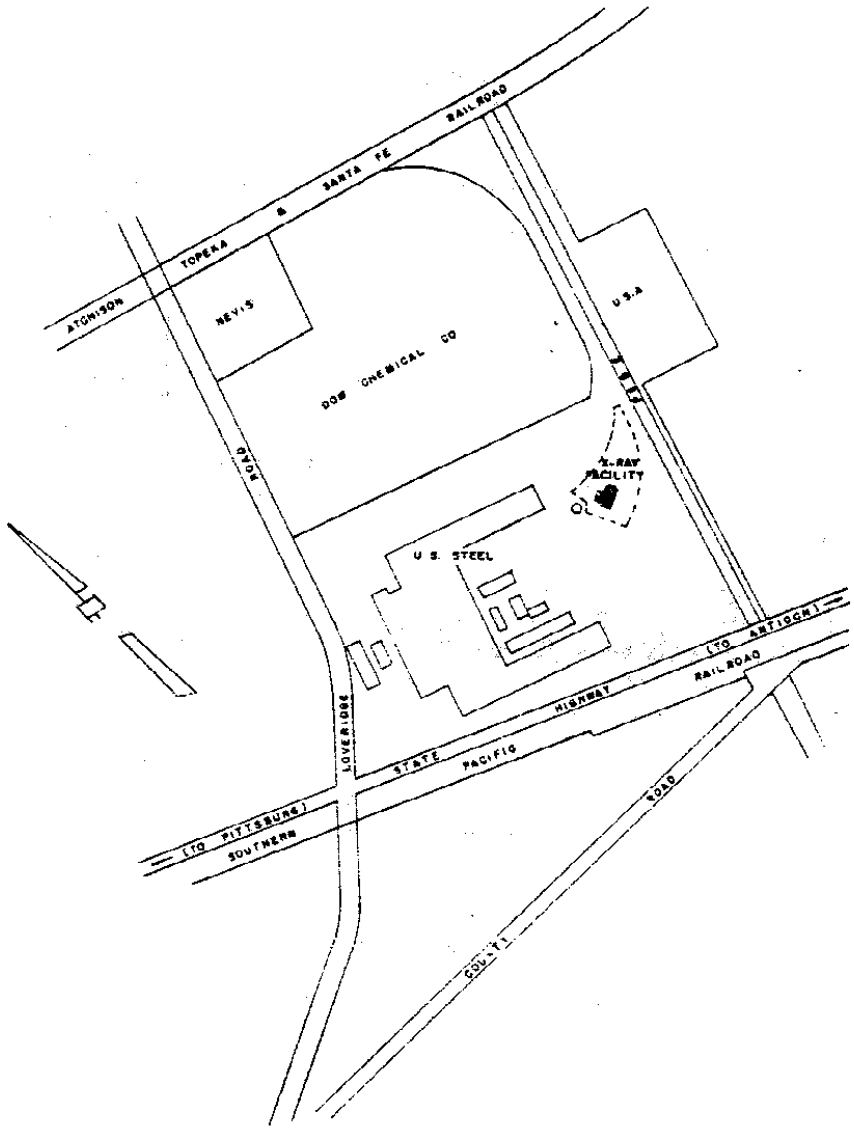


Figure 5–2 PITTSBURG RADIOGRAPHIC FACILITY, NWS CONCORD

Table 5-1

NWS CONCORD
ACREAGE SUMMARY

Description	Area (acres)	Total Area (acres)
NWS CONCORD		12,904.55
CONCORD TIDAL AREA		7,630.56
Mainland	6,059.56	
Islands	1,571.00	
CONCORD INLAND AREA		5,272.31
Operations/Support/Storage	5,213.41	
Naval Reserve Training Facility	.55	
Connecting Roads to Tidal Area	27.70	
Housing Area (Officers and Enlisted)	30.65	
Explosive Quantity-Distance Separation Area	935.76*	
Pittsburg Radiography Facility		1.68

*Not included in total

Source: Naval Facilities Engineering Command, Western Division, October 1979, NWS Concord Master Plan.

5.1.2 Organization and Mission. NWS Concord is a fourth echelon command under the authority of the Commander, Naval Sea Systems Command (NAVSEA). Figure 5-3 shows the chain of command for the station. NWS Concord is one of five NAVSEA weapons stations that include NWS Charleston, NWS Yorktown, and NWS Earle on the East Coast, and NWS Seal Beach on the West Coast.

NWS Concord has a dual purpose within NAVSEA. The station functions as the primary port of embarkation for ordnance materials on the West Coast and is homeport for the ammunition ships (AEs) of Service Squadron Three (SERVON 3). Currently, the squadron has five AEs: USS Haleakala (AE-25), USS Mount Hood (AE-29), USS Flint (AE-32), USS Shasta (AE-33), and the USS Kiska (AE-35). The station is also maintained by NAVSEA to provide fleet combatants with ready-for-use ordnance.

NWS Concord has been assigned the following tasks by Commander, NAVSEA, in connection with its overall function:

1. To receive, store, maintain, assemble, checkout, inspect, modify, protect, and issue conventional ammunition guided missiles and other classified weapons systems, technical items, and components;

2. To operate and maintain an ocean terminal facility to transship ordnance material, as well as a classified ordnance facility to include contingency support at Naval Air Station (NAS) Moffett Field;

3. To provide logistic support for the on- and off-loading of ammunition and miscellaneous services for foreign and domestic ships;

4. To dispose of ammunition;

5. To maintain and operate the West Coast ordnance handling equipment weight test center and an ordnance equipment overhaul facility;

6. To provide logistic and administrative support to homeported ships, as well as maintenance and utility support to tenant activities;

7. To operate the mobile ammunition evaluation renovation unit program for United States and allied Naval stocks of ammunition overseas;

8. To provide services to the Coast Guard Port Safety Station, as well as service and support to the Explosive Ordnance Disposal Mobile Unit, Pacific Detachment, Concord;

9. To provide specialized training in ammunition and explosive cargo handling and related subjects;

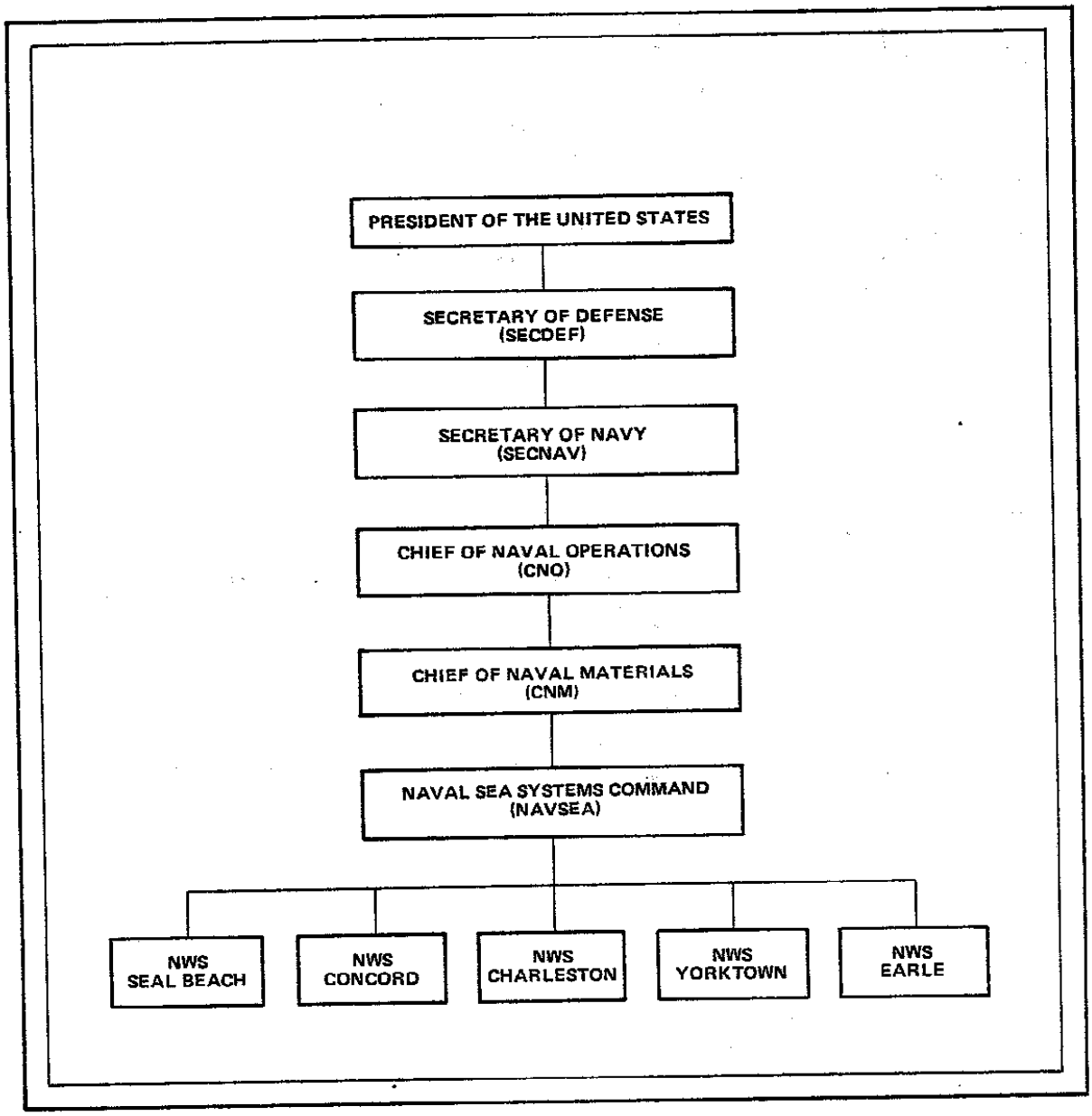


Figure 5–3 CHAIN OF COMMAND, NWS CONCORD

10. To provide facilities and technical supervision to assist in the training of Naval reserve units and personnel assigned to NWS Concord for mobilization; and

11. To provide laboratory facilities and services to conduct weapons quality engineering functions.

To carry out these functions, NWS Concord is organized into 13 departments and six staff positions.

The station provides 16 tenant activities with varying administrative and logistic support. These activities include the Marine Barracks, United States Coast Guard, Naval Regional Medical Center, Explosives Ordnance Disposal Mobile Unit, Navy Exchange, Naval Communication Station, and the Mt. Diablo Community Credit Union. The other tenants at NWS Concord are categorized as representatives and include the Naval Investigative Service, Cerberonics Inc., Marine Corps Liaison Office, Naval Facilities Engineering Command, General Dynamics Representative, Pacific Missile Test Center Representative, McDonnell-Douglas Harpoon Representative, and Naval Ship Weapons Systems Engineering Station Representative.

NWS Concord is the largest single employer in the Concord/Pleasant Hill/Walnut Creek Area; and as one of the largest employers in Contra Costa County, is a major contributor to the local economy.

5.2 HISTORY. Since the mid-1850s, Naval ordnance has been stored in the San Francisco Bay region. In 1854, Mare Island was chosen as the site of a Navy base in the then recently formed state of California. Commander David G. Farragut was assigned the task of constructing the Naval facilities. In 1857, Magazine A-1, located at the southern end of Mare Island, was put into service. It became the nucleus of the Naval Magazine, Mare Island Naval Shipyard (NSY Mare Island). Additional magazines were built in 1863 during the Civil War and again in 1890 and 1895, when the Spanish-American War increased the demands for ordnance. In 1906 and 1914, the Naval Magazine added storehouses, filling houses, and public works facilities.

By 1927, the expanding population and economic growth of San Francisco began to have significant effects on the land use and density of development in the north Bay Area. The small town of Vallejo, which had grown in support of the Naval Shipyard at Mare Island, progressively expanded to the east and south. Residential and industrial developments across the narrow Mare Island Strait forced the Navy to reduce its activities relating to explosives. This diminished Mare Island's explosives, industrial, and storage capabilities. The Navy formed a board to consider relocating to another site. It selected Bay Point, the site of the Pacific Coast Shipbuilding Company, because of its remoteness from populated areas and the presence of three major rail lines.

On 28 January 1936, the Naval Magazine at Mare Island was elevated to Naval Ammunition Depot status. An outloading pier, projectile filling houses, and new magazines and storehouses were constructed. After Pearl Harbor was bombed, the 12th Naval District recommended that the

Navy establish a major ordnance shipping depot at Bay Point and eventually relocate all ammunition functions from Mare Island to the proposed facility. Construction began on waterfront handling facilities at Bay Point in January 1942.

In the interim, Bay Point changed its name to Port Chicago. Additional land areas and facilities were added to the Port Chicago operation. On 4 December 1942, the new facility was officially commissioned the Naval Magazine, Port Chicago. When munitions passing through the Port Chicago waterfront exceeded the capacity of the new facility, a 5,143-acre area of land in the Diablo Creek Valley was acquired. The new land acquisition, about one and one-half miles south of the waterfront area, was linked to the Tidal Area by the Bay Point and Clayton Railroad.

On 7 July 1944, at 10:17 p.m., an explosion rocked Port Chicago and the surrounding area. Three and one-half million pounds of high explosives detonated, killing 322 people, injuring 390 others, and causing an estimated $12.5 million in property damage. To support the war in the Pacific, reconstruction was necessary. By May 1945, the station had six berths at three piers in operation and employed 5,865 military personnel and 2,016 civilians.

After Germany surrendered on 8 May 1945, operations began to slack off. After the Japanese surrender in August 1945, contracts for new facilities were cancelled. On 18 January 1946, the Naval Magazine, Port Chicago, became an independent command. Plans to relocate ordnance operations from the Mare Island facility were scrapped for lack of funds. Naval ordnance operations in the San Francisco Bay Area peaked again in 1953, with the American commitment to the Korean conflict, and in 1969 and 1972, at the height of involvement in Southeast Asia.

As weapons became more sophisticated, the Naval Magazine, Port Chicago, added specialized facilities. These included quality evaluation and engineering laboratories, industrial X-ray units, a guided missile test and repair center, and special weapons service and storage. The Port Chicago activity changed from a transshipment facility to a more comprehensive ordnance facility. This resulted in the consolidation of the Naval Magazine, Port Chicago, and the Naval Ammunition Depot, Mare Island. On 23 December 1957, they became the Naval Weapons Station (NWS) Concord, with Mare Island an annex of the station. The Mare Island annex was turned over to NSY Mare Island in June 1972. The weapons station annex is a tenant command at Mare Island and uses some 23 buildings for the repair of containers for missiles and other ordnance.

The Inland Area of NWS Concord continued to develop. Administration and most of the support functions of the weapons station were relocated from the Tidal Area to the northernmost section of the inland property. When the inland section was acquired, the City of Concord, with a population of about 3,000 in 1945, also experienced growth and expansion, reaching a population of 99,480 in 1970. Housing subdivisions, schools, and commercial sections soon faced the station on the eastern and southern boundaries.

Port Chicago, formerly Bay Point, was a support community first for the Pacific Coast Shipbuilding Company, the Cross Bay Timber Company, and other early industrial operations; and later as the residence for many of the employees of Naval Magazine, Port Chicago. Over the years, the threat of another explosion kept the population low (about 3,000 residents in 1967). As early as 1954, the Navy attempted to remove the civilian population from within the Explosive Quantity-Distance Separation Arcs of the ordnance wharves. However, it was not until 21 October 1967 that Congress passed Public Law 90-110 authorizing the acquisition of all land within a two-mile radius of the loading piers, about 5,021 acres. Funds for the acquisition were subsequently approved, and the Navy began moving the public. The Navy kept several public and commercial structures in this area and razed the rest. Unfortunately, the high cost of replacing several public roads, railroads, and industrial facilities prevented the complete acquisition of the authorized land area.

At present, NWS Concord's ammunition handling ability provides the Navy with a West Coast activity compatible with the most current and efficient means of transshipping bulk munitions.

5.3 PHYSICAL FEATURES.

5.3.1 Climatology. The mean annual precipitation for NWS Concord is 14 inches, as shown on the Isohyetal Map of the San Francisco Bay Region prepared by the United States Geological Survey in 1971. As in most of northern California, about 84% of the rainfall occurs from November through March. The climate in this area is characterized by westerly winds coming through the wind gap formed by the San Francisco Bay and Carquinez Strait. Particularly dominant during the summer months, these westerly winds are minimal from November through February. Occasionally, the late spring and summer weather is influenced by a high pressure ridge over the interior of California, with resulting high temperatures. The average temperature varies from 45°F in January to 75°F in August. In 1960, a high of 106°F in August and a low of 17°F in January were recorded. During the hard freeze of December 1972, the recorded low was 16°F.

5.3.2 Topography. Station elevations range from slightly below sea level in the Tidal Area to ridges of nearly 800 feet along the northern boundary of the Inland Area. Originally, the Tidal Area consisted of three distinct land formations: salt marshes along the shore of the Suisun Bay, upland colluvial slope, and sandstone hills. A large section of the marshland was modified when the original weapons station was constructed by adding large amounts of fill material. Almost all existing tidal facilities were built in these fill areas. The former city of Port Chicago was located in an area of higher elevation and gentle slope designated as colluvial slope. The area to the south of Contra Costa Canal is characterized by steeply sloping terrain, beginning with a 100-foot elevation and rising to over 600 feet. The hills are composed of soft sandstone which is poorly suited for construction.

Included in the acreage for the Tidal Area are four islands (Freeman, Roe, Ryer, and Snag) located in Suisun Bay directly to the north of

the shipping channel and two islands (Seal Islands) above the barge pier. The islands are covered by Explosive Quantity-Distance Separation Arcs and were acquired along with the two-mile buffer zone which forms the rest of the Tidal Area. Physically, they are similar to the salt marsh areas discussed above.

The Inland Area is similar in character to the central and higher portions of the Tidal Area. Gently sloping land extends through most of the western half of the Inland Area, while the tidal hills extend south and form the eastern boundary of the station.

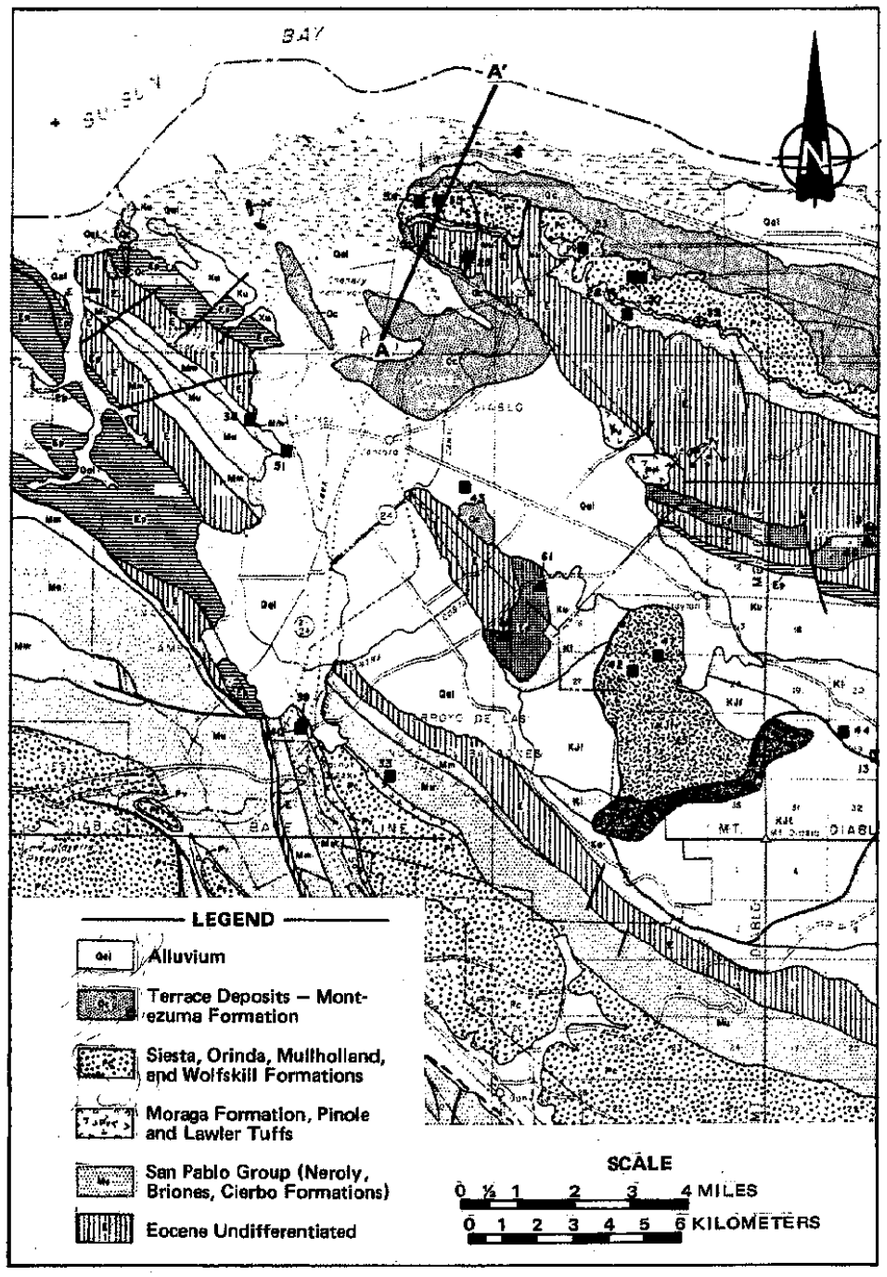
5.3.3 Geology. Figure 5-4 is a geological map of NWS Concord with a cross-sectional depiction of the structure of the major geological formations. The up-thrusted bedrock feature which topographically separates the Inland and Tidal Areas is typical of the geology of Contra Costa County, where northwest trending fault systems such as the major, active Antioch, Concord, and Pleasanton faults divide the county into large up-and-down-thrown blocks of Tertiary-age rock. Over 200 earthquakes have been reported in Contra Costa County since 1934. The up-thrown blocks form the hills and the down-thrown blocks form the valleys. Unconsolidated Pleistocene-age alluvial sediments eroded from the up-thrown blocks partially fill the down-thrown valleys, often accumulating in thicknesses exceeding 500 feet.

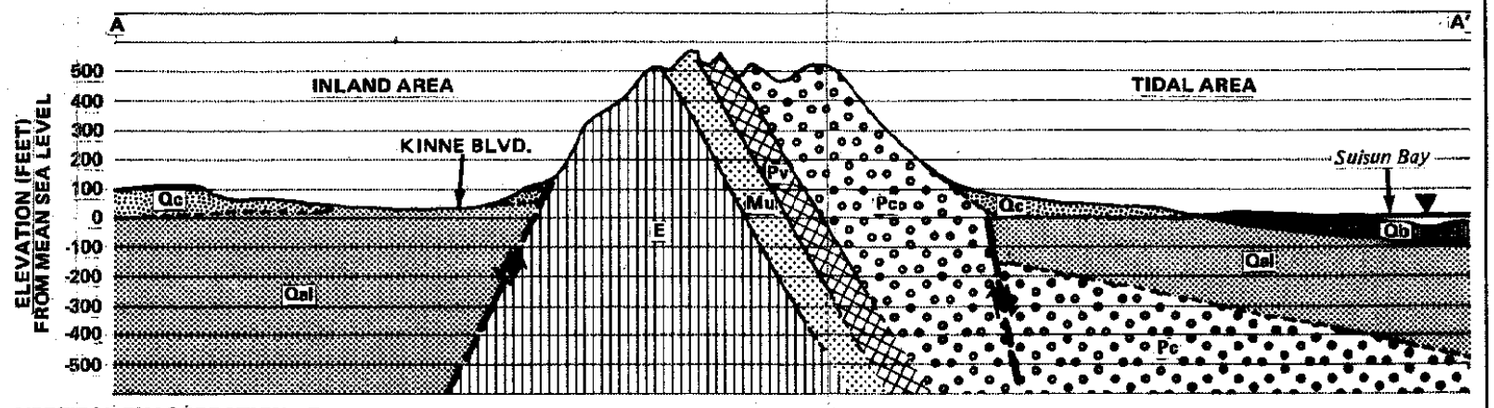
The Pleistocene alluvium serves as an aquifer in the area of NWS Concord. Well logs obtained from the California Department of Water Resources indicate that the alluvium thickness is at least 500 feet in most areas where it occurs. The materials present are highly variable vertically and horizontally, ranging from highly permeable gravels to very slowly permeable "blue clays." All wells drilled into this formation are cased, with the casing perforation intervals custom-filled to the locations of the permeable strata in each well.

Alluvial material permeabilities vary. State records on specific capacity tests on wells in the area range, for example, from as low as 3.2 gallons per minute per foot of draw down after only five hours of pumping, to as high as 15.7 gallons per minute per foot after 24 hours of pumping.

5.3.4 Soils. The predominant soil associations found on NWS Concord are listed and described in Table 5-2. For detailed information on soils, see the United States Soil Conservation Service's Soil Survey of Contra Costa County published in September 1977.

5.3.5 Hydrology. NWS Concord lies within the Mt. Diablo-Seal Creek Watershed, which drains about 36 square miles of land. The watershed is bounded on the south by the north peak of Mt. Diablo and on the north by Suisun Bay. Streams that drain the watershed have their headwaters on the slopes of Mt. Diablo and flow by way of Mt. Diablo Creek through Clayton Valley and the weapons station to the outlet at Suisun Bay. From the beginning of the tidal marsh to Suisun Bay, a distance of about two miles, the name of the creek changes to Seal Creek. The creek is known as Seal Creek throughout its length on the weapons station.





VERTICAL EXAGGERATION = 5x

LEGEND

- Qb — Bay Mud
- Qal — Alluvium
- Qc — Terrace Deposits - Montezuma Formation
- Pc' — Volcanic Tuffs - Orinda Formation
- Pv — Volcanic Lavas - Moraga Formation
- Mu — Marine Conglomerates - San Pablo Group
- E — Undifferentiated Marine Sandstones and Shales

SOURCE: Adapted from Contra Costa County—Geologic Map showing Mines, Quarries, and Gas Wells, 1958, California Division of Mines and Geology.

Figure 5–4 GEOLOGIC CROSS-SECTION SHOWING MAJOR FORMATIONS AT NWS CONCORD

Table 5-2

PREDOMINANT SOIL TYPES AT NWS CONCORD

Soil Designator	Description
AN-Sf/F2	Found in the Inland Area; occurs on 30 to 50% slopes in steep uplands; moderately deep to deep; well drained; high erosion hazard factor
Cm-Bic	Found on alluvial fans and low terraces; very deep; well to moderately well drained; exhibits an erosion factor of none to slight, except for erosion caused by stream cutting
TI-Ax/BD-2	Found in the Tidal Area on slopes of 2 to 15%; characterized by dense clay subsoils between 14 to 30 inches deep; moderately drained; moderate erosion hazard
TZ	Found in tidal flat areas; consists of very poorly drained soils subject to tidal inundation; composed of stratified silts, clay, and organic material; strongly saline
Pn-Km/BC-2	Occurs on 2 to 9% slopes but includes some dissected areas with moderately steep slopes; drainage is slow to medium; erosion hazard is slight to moderate

Historical records show that flooding occurs in the watershed almost every year. Major floods occurred in 1938, 1952, and 1955. The area of Mt. Diablo Creek between Clayton Canal and Arnold Industrial Highway is not a source of severe overbank flooding because the channel has been deeply incised in that area. The channel downstream of Arnold Industrial Highway becomes progressively smaller, and flooding occurs on the Concord Municipal Golf Course, the entrance to the weapons station, Port Chicago Highway, and the tidal marsh. Flooding is more frequent in this reach than anywhere else in the watershed.

The water in Suisun Bay is a mixture of fresh- and saltwater, with a resultant salinity ranging from five to eight parts per thousand. The water quality is generally poor, with high levels of turbidity and suspended solids.

There are moderate amounts of groundwater on the weapons station, both in the unconsolidated formations and the bedrock. However, satisfactory yields can generally be obtained only by drilling deeper bedrock wells. Until the early 1960s, NWS Concord did in fact obtain its water supply from three 500-foot-deep wells. However, at that time, the wells were shut down and NWS Concord, as is the case with nearly all Bay Area communities, now derives its water supply from surface sources.

Groundwater quality is generally only fair. Total dissolved solids, hardness, chlorides, and iron concentrations are relatively high, especially when compared to available surface water in the area.

Some wells are still used for water supply. In particular, with respect to NWS Concord, these include several wells in the industrial complex area to the west, used primarily for process water and cooling water, and a series of wells surrounding Mallard Reservoir, also to the west. The owner of the Mallard Reservoir, the Contra Costa County Water District, uses the groundwater to augment the normal aqueduct supplies of drinking water to the reservoir during droughts (see Figure 5-5).

5.3.6 Migration Potential. Contaminants spilled on the ground in the Inland Area eventually drain to the Suisun Bay by way of Mt. Diablo/Seal Creek and Hastings Slough. Contaminants spilled in the Tidal Area eventually drain to the bay by way of Hastings Slough, Belloma Slough, or any one of a number of minor channels that drain the wetlands which comprise most of the tidal marsh.

Contaminants percolating to the water table must move primarily through sandy silt to clay alluvial materials. The probable maximum permeabilities in such materials would be approximately 10^{-3} centimeters per second. The maximum hydraulic gradients in the lower elevation areas (where contamination is most likely to have occurred) would not be greater than the land surface slope, or approximately 40 feet per mile. The porosity for such materials would be on the order of 30%. Therefore, the maximum likely contaminant flow rate at NWS Concord would be approximately 26 feet per year. Since the weapons station is 40 years old, the maximum probable horizontal contaminant migration distance would be approximately a radius of 1,000 feet.

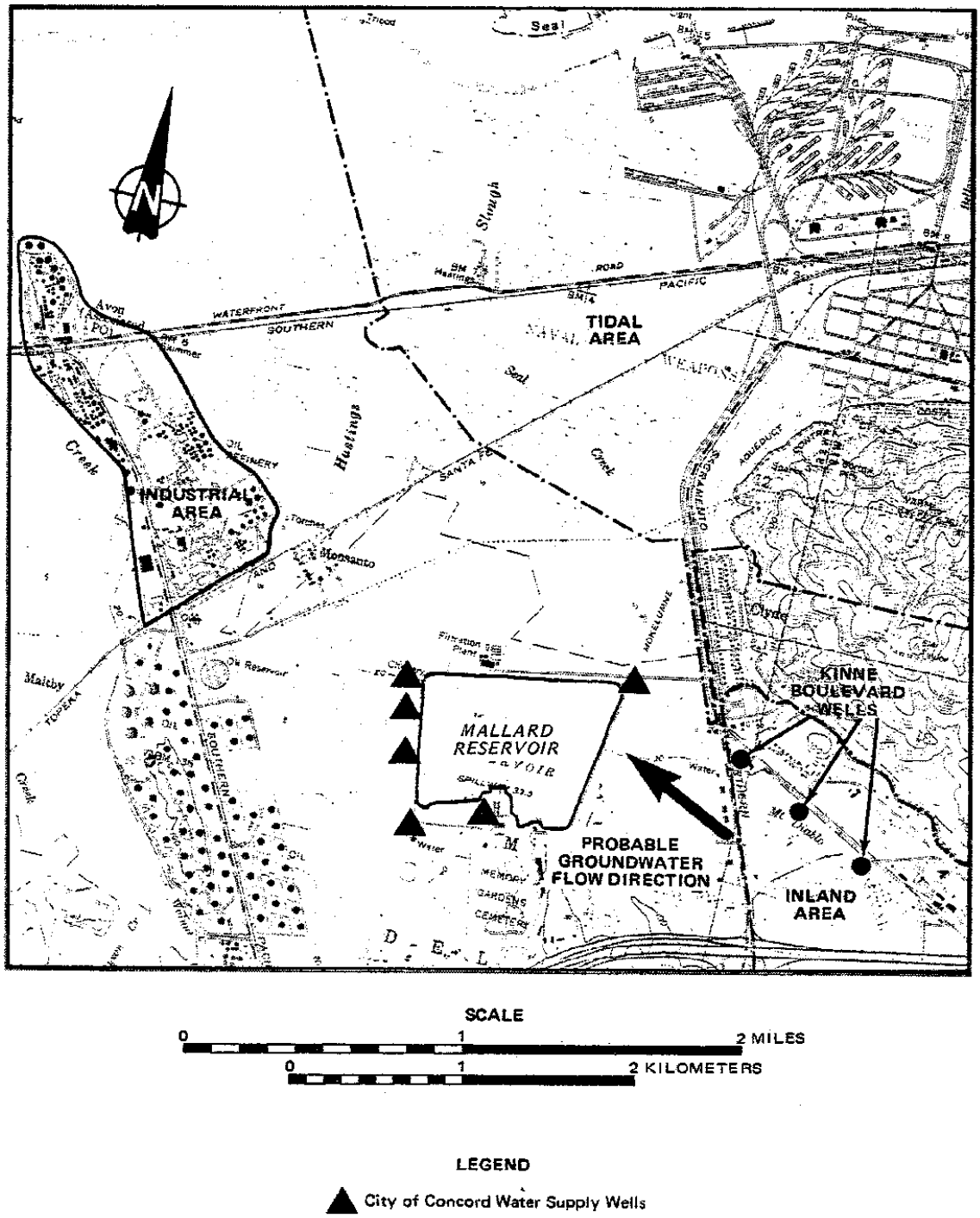


Figure 5–5 LOCATION OF WATER WELLS IN VICINITY OF NWS CONCORD

The Mallard Reservoir wells almost certainly are downgradient of the Kinne Boulevard wells. However, since the distance between the two sets of wells is approximately 2,500 feet, it is likely that the contaminants, if present, have not yet reached the vicinity of the Mallard Reservoir. Nevertheless, if the wells ever have to be heavily used (such as during the next drought), the high pumping rate will greatly increase the existing hydraulic gradients and proportionately speed up the migration rate of the contaminants.

5.4 BIOLOGICAL FEATURES.

5.4.1 Fauna. A variety of wildlife species inhabit the weapons station. Game animals include waterfowl, upland birds (such as doves, quail, and pheasants), cottontail rabbits, and jack rabbits. Mallards, cinnamon teal, and gadwalls have been reported nesting in the tidal marshes and on Ryer Island. A pair of golden eagles once inhabited a eucalyptus grove located near the high eastern boundary of the Inland Area, but has not been seen recently. Their nesting tree was toppled in a storm in the winter of 1981/82. Tables A-1 and A-2 in Appendix A give a complete listing of bird and mammal species in the Contra Costa County Area.

The character of the important fisheries of San Francisco Bay (Chinook salmon, striped bass, sturgeon, shad, Pacific herring, northern anchovy, starry flounder, surfperch, elasmobranches, bay shrimp, and bivalves) has changed dramatically over the past century. Many commercial fisheries that were once important to the Bay Area economy have disappeared (e.g., the river fishery for Chinook salmon and the extensive clam and oyster industries), and although other commercial fisheries have been revived in recent years (e.g., herring, bay shrimp), there has been an overall change in emphasis from commercial to recreational fishing. This has been largely due to legislation restricting the commercial harvest of anadromous species such as salmon, striped bass, and sturgeon.

Man-induced changes in the environment are implicated in the decline of certain fishery resources. Water storage and diversion projects have affected the distribution and abundance of salmon and striped bass, and land reclamation and domestic sewage pollution essentially eliminated the clam and oyster industries. Fishing pressure has also been linked to the decline of the bay shrimp and sturgeon fisheries.

The San Francisco Bay contains large numbers of shellfish species, some of which have known potential commercial and recreational value, such as the soft-shell clam, Japanese littleneck clam, mussels, and the native oyster. Although considerable progress has been made in improving water quality in the bay in recent years, shoreline waters are apparently not yet free enough of sewage contamination for the State Public Health Department to sanction harvesting of bay shellfish for consumption.

The Suisun Bay is a transition zone between salt- and freshwater and contains a diverse population of fish, bottom dwelling organisms (benthic invertebrates), and zooplankton. Major groups of benthic

invertebrates and zooplankton identified at the station are listed in Tables A-3 and A-4, respectively, in Appendix A.

In the Suisun Bay, the opossum shrimp is the primary food source for young fish-eating species as well as larger filter-feeding species. Larger fish consume available small fish and seasonally abundant bay shrimp. The common forage foods in Suisun Bay are young striped bass, pond smelt, Sacramento smelt, and northern anchovy. Table A-5 in Appendix A contains a representative listing of the fish found in the area.

The California Department of Fish and Game has a "mark and release" study underway designed to determine the survival rate of king salmon stocked off Vallejo, Port Chicago, and the Feather River Hatchery in Oroville, California. It is hypothesized that king salmon stocked off Port Chicago have a better chance of surviving their migration down the bay, since there is a richer food source available in Suisun Bay. The study has been ongoing since 1980 and is expected to continue until 1985. The salmon are stocked between early May and October.

Located to the north of the NWS Concord Tidal Area is the Suisun Bay brackish water marsh. This area is one of the most significant fish and wildlife habitats in California. The California Department of Fish and Game owns 13,000 acres of the marsh. One of the more popular recreational uses of the marsh is duck hunting. Approximately 160 duck clubs are located in the area. Recreational fishing for salmon, trout, shad, bass, and sturgeon also takes place in this area. In addition, the Suisun Bay is a migration route for Chinook salmon and American shad, as shown on Figure 5-6.

A cooperative agreement established with the California Department of Fish and Game has resulted in the maintenance of a herd of Tule elk on the weapons station. About 2,000 acres of the NWS Concord Inland Area have been set aside for this project, which currently supports about 40 Tule elk, as shown on Figure 5-6.

The habitat of endangered, threatened, and rare species takes on special significance because of federal and California state laws enacted to protect these species and their habitats. Both the United States (Endangered Species Act of 1973) and the State of California (California Endangered Species Act 1970) protect designated endangered fish and wildlife, publish lists of these species, and give notice of the status of each species.

San Francisco Bay and its immediate surroundings support designated rare and endangered plant and wildlife species, but no rare or endangered fish species. The species are listed in Table 5-3.

The official state of California listing of endangered or rare animals is contained in the California Administrative Code, Title 14, Section 670.5. The official federal designations of endangered and rare species are published in the Federal Register.

The station's marshlands provide habitat for the salt marsh harvest mouse, Reithrodontomys reviventris, a federal and state endangered

Figure 5-6

This detailed station map has been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

Table 5-3

RARE AND ENDANGERED SPECIES OF
SAN FRANCISCO BAY AND VICINITY

Common Name	Scientific Name	Federal*	State*
Amphibians			
San Francisco garter snake	Thamnophis sirtalis tetrataenia	E	E
Birds			
California least tern	Sterna albifrons browni	E	E
California black rail†	Rallus longirostris obsoletus	E	E
California clapper rail	Laterallus jamaicensis coturniculus		R
Southern bald eagle	Haliaeetus leucocephalus leucocephalus	E	E
American peregrine falcon	Falco peregrinus anatum	E	E
California brown pelican	Pelecanus occidentalis californicus	E	E
Mammals			
Salt marsh harvest mouse†	Reithrodontomys raviventris	E	E

*E: Endangered
R: Rare

†These species are found in the immediate vicinity if NWS Concord. Several species within the figwort family of plants, listed as federally and state rare and endangered species, are located in the immediate vicinity of NWS Concord, but may not be actually located on base.

Source: United States Fish and Wildlife Service and California Department of Fish and Game, 1979, Protection and Restoration of San Francisco Bay Fish and Wildlife Habitat.

species. Critical habitat for the salt marsh harvest mouse has been designated, and more than 300 acres of marsh habitat have been set aside as an environmental mitigation measure.

Three specific wildlife areas in the Inland Area have been designated and fenced, as shown on Figure 5-6. These areas have been established to allow a natural habitat. Wildlife area 1-75 includes the eucalyptus grove where a pair of golden eagles have nested in the past. Area 2-75 includes a natural spring and impoundment which serve as a watering place for many wildlife species. Area 3-75 is located on a rocky hill and includes a spring and rock cistern.

To the north and northwest of NWS Concord, the Suisun brackish water marsh provides habitat for the salt marsh harvest mouse and the California clapper rail, Rallus longirostris obsoletus, both of which are state and federally listed endangered species, as well as the California black rail, Laterallus jamaicensis coturniculus, which is listed as a state protected rare species. Figure 5-6 shows the general areas where these species are known to occur.

The salt marsh and tidally influenced areas are areas of concern because they provide food and protection for many plant and animal species. The riparian habitat associated with Mt. Diablo/Seal Creek and its two small tributaries on the station also provides shelter and food for many species.

5.4.2 Flora. Roe and Ryer islands and the lower, wetter portions of the Tidal Area are predominantly covered by marsh type vegetation which is tolerant of frequent inundation by saltwater. Vegetation present consists primarily of bulrush, baltic rush, pickleweed, cattails, saltgrass, and perennial grasses. In addition, dense growths of California rose, coyote bush, and sweet fennel occur on the levees on the islands.

The dryer eastern portion of the Tidal Area and all of the Inland Area are essentially grasslands supporting a variety of upland forests and grasses, as well as several species of shrubs and trees. The latter is represented by scattered groves of eucalyptus which occur along the slopes of canyons and near the Inland Area near Kinne Boulevard. Roadside windbreaks of pine and juniper occur near the entrance to the Inland Area. The areas bordering Mt. Diablo Creek support a varied flora dominated by willows and numerous perennial brush-type plants. Table A-6 in Appendix A is a list of the flora generally found in Contra Costa County.

The United States Fish and Wildlife Service indicates that there is one localized concentration of plants in the figwort family in the vicinity of Tidal Area (see Figure 5-6); the figwort family of plants contains several state and federally designated endangered species.

5.5 ADJACENT LAND USE. Land use in the vicinity of NWS Concord is shown on Figures 5-7 and 5-8. Suisun Bay and a conglomerate of islands containing marshlands and numerous man-made levees are located to the north of the Tidal Area. As mentioned previously, Ryer, Roe, Freeman, Snag, and Seal islands are a part of the NWS Concord landholdings. Portions of these islands are leased out to duck hunting

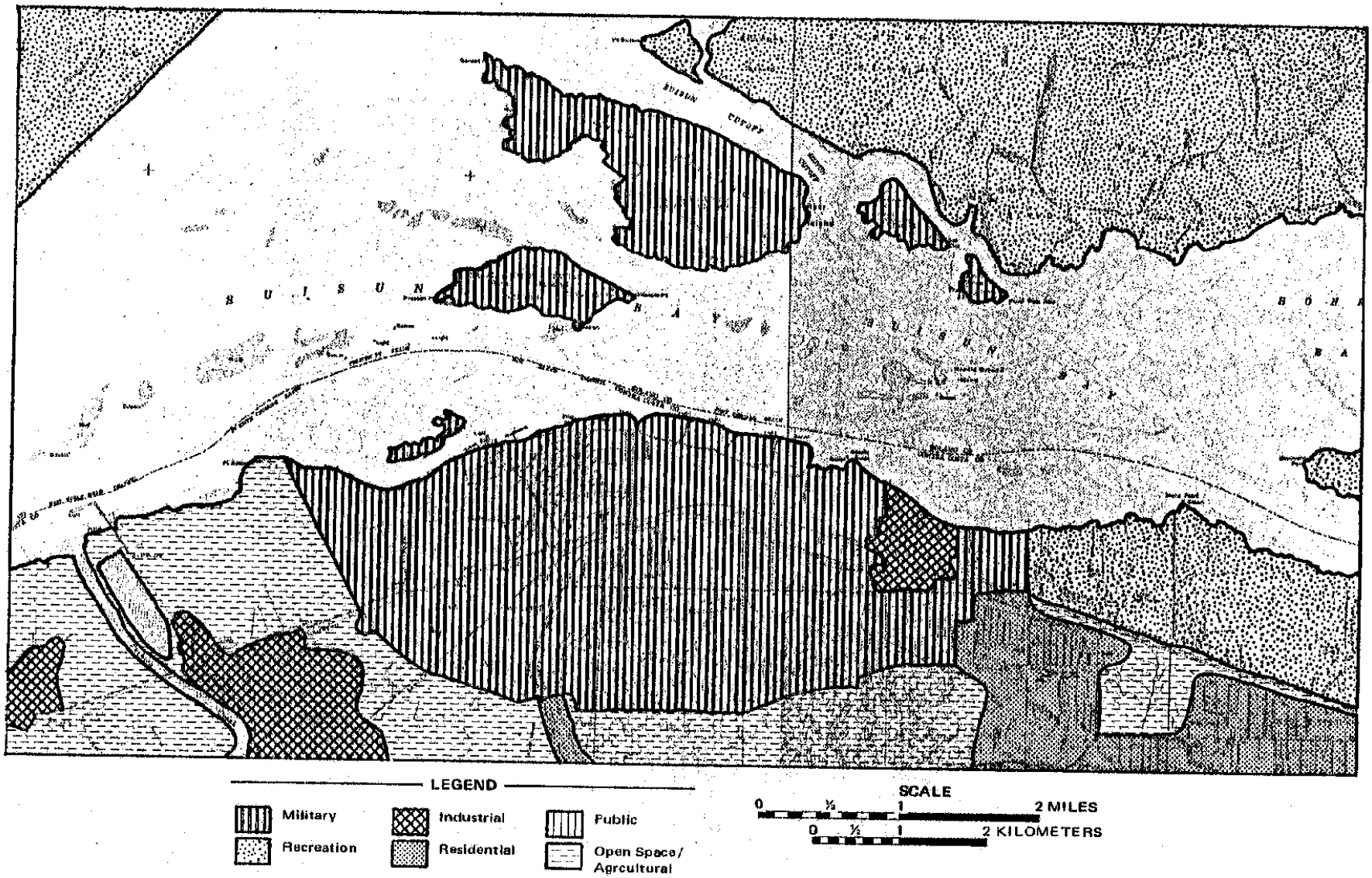


Figure 5–7 EXISTING LAND USE TIDAL AREA

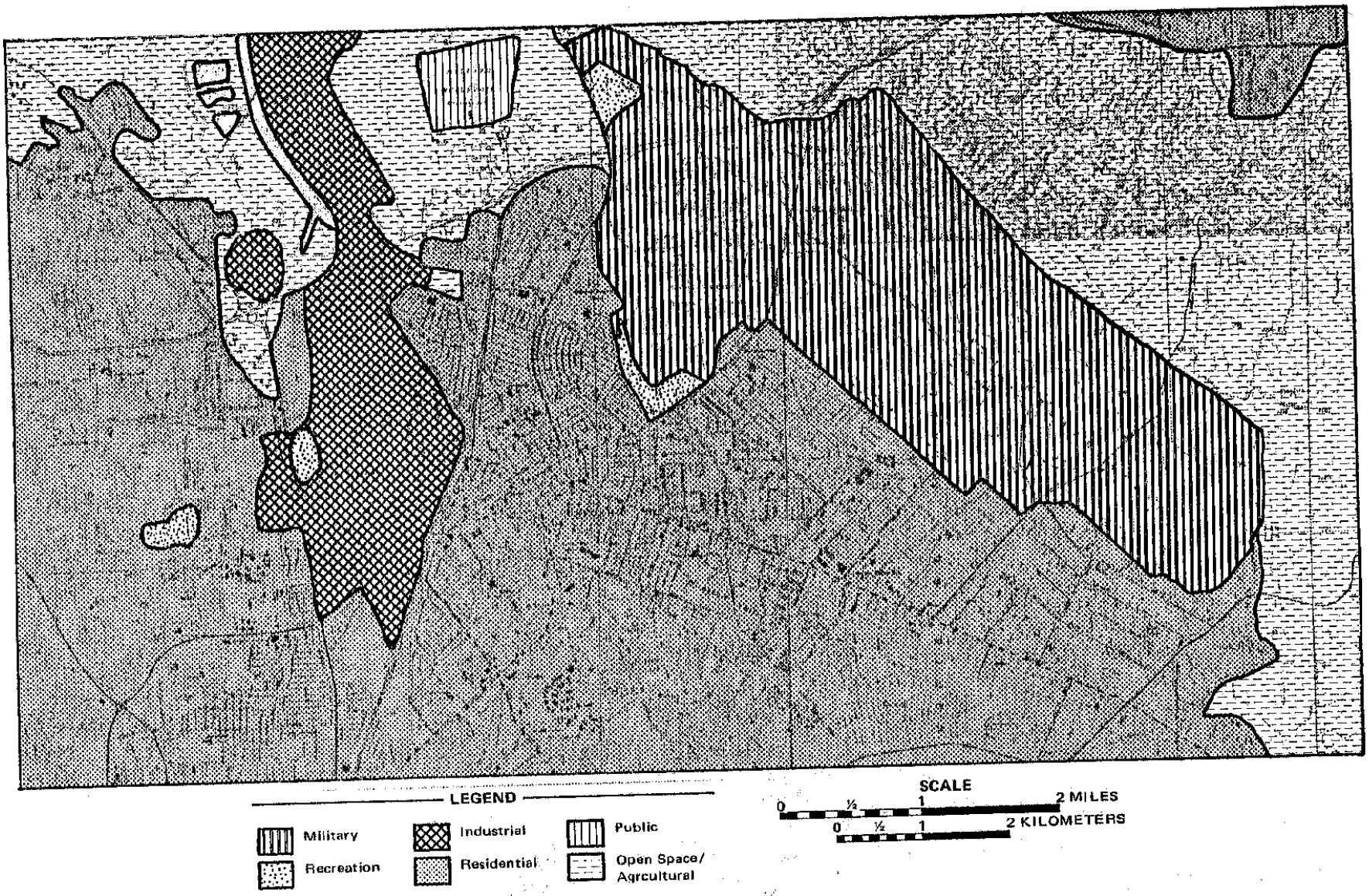


Figure 5–8 EXISTING LAND USE INLAND AREA

clubs. The other islands in this area are privately owned and managed as a wetland system by the Suisun Marsh Conservatory. Recreational activities, such as duck hunting and fishing, constitute the major land use in this area, although farther to the north, portions of the islands are used for growing specialty crops, such as asparagus.

Within the Tidal Area there is a privately owned parcel of land which belongs to three chemical companies: the Allied Chemical Corporation, the Collier Carbon and Chemical Corporation, and the Chemical and Pigments Company. The Collier plant is no longer in operation, and the Navy is considering acquiring the 17.6 acres occupied by the plant. The Allied Chemical plant is engaged primarily in the manufacture of aluminum sulfate, sulfuric acid, hydrofluoric acid, nitric acid, and acetic acid. The Chemical and Pigment Company is involved in the manufacture of inorganic chemicals. There have been incidents in the past of contamination of NWS Concord lands by activities of these chemical companies.

Three railroads, the Santa Fe, the Southern Pacific, and the Sacramento Northern, own rights-of-way which bisect the Tidal Area. The Port Chicago Highway and the Waterfront Road, both county owned roads, and the Contra Costa Canal complete the list of non-Navy controlled land uses within the NWS Concord Tidal Area.

Land to the east of the station's Tidal Area is sparsely developed, with only a small residential area named Shore Acres and the McAvoy boat harbor. Oil refineries are located farther to the east, adjacent to the Suisun Bay in the City of Pittsburg.

The hills which separate the Tidal and Inland Areas are the site of the Los Medanos underground gas storage field. This land is privately owned and is leased to the Pacific Gas and Electric Company for deep well gas injection. The land is also used for cattle grazing. Located 15 miles to the southeast of the station is the Mt. Diablo State Park and State Game Refuge. This 7,004-acre preserve contains picnic facilities, campsites, and hiking trails.

The station is bordered on the south by the residential sections of the City of Concord. These neighborhoods are made up of single-family, medium-density housing. Most of the housing dates from the mid-1950s. In addition, seven public schools and several parks parallel the Navy property line. Steep slopes and access problems have prevented extensive development along Kirker Pass Road and in the hills northeast of the weapons station. These areas are still zoned for open space and agricultural land uses. A recent exception to this is the Concord Pavilion, which was constructed on Kirker Road near the station boundary.

The Concord Municipal Golf Course occupies a triangular parcel of land between State Route 4, the Port Chicago Highway, and the station's administration/support complex. The golf course is partially on 65.88 acres of city land and partially on a 103.12-acre tract of leased station land.

To the north of Route 4 and to the west of the station, land is available in areas zoned for industrial development. Several firms have located here in the last few years, particularly along the Port Chicago Highway across from the main gate of the weapons station. Phillips Petroleum Company and Monsanto Chemical Company have facilities along Solano Way near Waterfront Road. There have been no incidents of contamination of Navy lands by these industries. The City of Concord has a large water treatment plant and reservoir just west of Port Chicago Highway.

Between the Inland and Tidal Areas is a small community known as Clyde, which has a population of 300.

A major oil spill which polluted and damaged the NWS Concord marshlands occurred in 1979 at the Tosco Oil Refinery, located on Suisun Bay on the eastern shore of Pacheco Creek, just west of the station. The incident occurred when a drain valve on a tank was left open. Approximately 2,000 gallons of oil drained into the marsh. Tosco cleaned up the spill to the satisfaction of NWS Concord officials.

5.6 LEGAL ACTIONS. A survey of past environmental litigation brought against NWS Concord revealed that in 1978 the station received a cease and desist order from the Central Contra Costa Sanitary District due to excessive chemical oxygen demand, chromium, and cadmium in the station's sewage effluent. The problem was immediately rectified, and no further action was taken by the Central Contra Costa Sanitary District. The only other legal problem associated with the weapons station concerned an air pollution violation which resulted from the use of the wood hogger. This problem was also corrected, and the wood hogger has since been decommissioned.

CHAPTER 6. ACTIVITY FINDINGS

6.1 INTRODUCTION. The sections that follow describe the purpose and organization of each activity at the station, its relationship to other activities, and its past hazardous materials management practices. In addition, the following discussions provide a more detailed explanation of the various disposal areas.

6.2 ORDNANCE OPERATIONS.

6.2.1 Ordnance Department. The Ordnance Department is responsible for the care and maintenance of munitions, including transshipment, quality assurance, and some limited renovation. Two types of munitions are handled at NWS Concord. Conventional ammunition includes ammunition developed for World War II weapons systems and the newer gun type weapons. Conventional ammunition includes all gun ammunition used by combat ships and aircraft, as well as all air-dropped bombs. The other type of ammunition is mission-oriented and includes the newer, more sophisticated mines and missiles, as well as classified and unclassified weapons. The mission-oriented weapons are complex and require careful storage and periodic maintenance and inspection. NWS Concord specializes in six different air launched and three surface launched missiles, all of which require unique facilities and test equipment. The majority of the mission-oriented weapons maintenance is conducted in the Inland Area (Buildings IA25, 87, 93, 97, and 263); however, the R Area buildings are also used for missile assembly.

6.2.1.1 Building 97. Building 97 in the NWS Concord Inland Area houses the Rocket Motor Maintenance Facility of the Guided Missile Department. Specific operations in the building include the rebuilding of rocket motors, parts cleaning and painting, and rocket engine testing in isolated test bays. Hazardous materials presently used in the building are trichloroethane, epoxy, ethyl alcohol, contact cleaners, corrosion preventatives, oil, rocket fuel (JP-5), and paints. Extremely small amounts of oil, cleaner, and solvent wastes are generated at Building 97. These are collected by the Public Works Center and disposed of off base. Paint sludges are bagged and similarly handled. Prior to its closing, the Tidal Area Landfill received all wastes from the building.

Leaks in the underground rocket fuel tanks at Building 97 would impact groundwater quality. However, Missile Department personnel stated that no leaks in the tanks have ever been discovered. Personnel interviewed added that no fuel is wasted at the building; spilled or extraneous fuel is reused in the building heating system.

6.2.1.2 Building 7SH5. Building 7SH5, which was an ammunition storage magazine prior to 1970, has since housed maintenance operations for the Guided Missile Division of the Ordnance Department. Specific activities at the building include paint stripping and the cleaning and painting of missile wings and fins. The cleaning and stripping operations primarily employ acetone, trichloroethane, methyl ethyl ketone, chloroethane, and several types of paint thinners. A

hazardous waste inventory conducted by the Public Works Center at NWS Concord in 1980 indicated the following quantities for wastes generated annually at the building:

Trichloroethane	40 gallons per year
Acetone	40 gallons per year
Methyl ethyl ketone	5 gallons per year

These amounts are indicative of past generation rates; less than 9,000 gallons have been generated in the past 12 years. The Public Works inventory stated that essentially all amounts of paint thinner and chloroethane are used up in building operations.

Since Building 7SH5 was converted to house missile maintenance operations, a paint booth has been located in the building. Depending on the work load, the paint booth is used intermittently for painting missile wings and fins. Most of the paints presently used at the building are dispensed from spray cans. Relatively small amounts of paint wastes or sludge have been generated. For the past five to six years, paint sludges generated at the spray booth have been collected in bags and disposed of off base. Expended spray paint cans are presently placed in dumpsters with other trash generated at the building. From 1970 to 1978, the Tidal Area Landfill received all wastes from Building 7SH5.

There have been allegations that paints, oil, and solvents have been spilled on the surrounding grounds or into a nearby drainage ditch. Subsequent interviews with several Missile Department personnel failed to substantiate these allegations, although one employee interviewed stated that until the late 1970s few controls were placed on waste disposal practices at the building. Quantities of materials that may have been disposed of at the building could not be determined, but are probably less than 100 gallons a year.

6.2.2 Weapons Quality Engineering Center (WQEC). The WQEC at NWS Concord performs testing and calibration of ordnance materials, systems, and propellents. WQEC consists of eight divisions, of which only one, the Scientific and Engineering Division, conducts activities resulting in the generation of hazardous waste. This division encompasses several testing facilities, including radiation testing laboratories located both at NWS Concord and at a separate facility in Pittsburg, California; a chemical laboratory; X-ray facilities; a photography laboratory; an environmental test laboratory; and a materials test laboratory. These facilities are discussed below, with the exception of the radiological facilities, which are discussed separately in Section 6.4.

6.2.2.1 Chemical Laboratory. The WQEC chemical laboratory, located in Building IA20, is primarily used in the testing of oils and hydraulic fluids and in the development of new weapons test methods. Hazardous wastes generated by the laboratory include the following:

Freon 113 (Genesolv D)	100 gallons per year
Denatured alcohol	50 gallons per year
Mineral spirits	50 gallons per year
Oil	50 gallons per year

In addition to the waste materials listed above, small quantities of acids and bases are generated by the laboratory. These are routinely neutralized and disposed of into the sewer system with the permission of the Contra Costa County Utilities District. Wastes presently generated at the chemical laboratory are collected by the Public Works Center and disposed of off base.

In the past, some wastes from the laboratory were disposed of on surrounding property. Between 1964 and 1968, Freon 113, a hydraulic fluid, was routinely disposed of onto soil behind Building IA20 at a rate of about one gallon per week. In 1968, the practice was stopped when the material was found to be hazardous. The soil has since been excavated and disposed of. The chemical laboratory occasionally generates varying quantities of explosive wastes. In the past these wastes were combined with similar wastes from the Ordnance Department, containerized, and deep sea dumped until the practice was outlawed in the early 1970s. Presently, the material is collected by the Public Works Center and disposed of off base.

6.2.2.2 X-Ray Facilities. The WQEC Scientific and Engineering Division operates two X-ray facilities: one in Building IA58 at NWS Concord and the other at its Pittsburg facility. The only hazardous wastes generated by these facilities are film developers, fixers, and starters. Approximately 10 total quarts of these wastes are generated daily at Building IA58. The Pittsburg facility generated considerably less when operating; however, it has not been in use for several years. Since 1952, all wastes from the X-ray facilities have been handled in the same way. All fixer wastes are put through a silver extraction system, then combined with waste starter and developer, diluted to one part in about 600 parts water, and legally discharged to the sewer system with the approval of the Contra Costa County Utilities District.

6.2.2.3 Photography Laboratory. The WQEC photography laboratory has been located in Building IA22 at NWS Concord since 1955. The facility processes both color and black and white film. Hazardous wastes are generated in much smaller quantities at the photographic laboratory than at either of the two WQEC X-ray facilities, averaging about one gallon of liquid waste per week. Such wastes include Kodak "Ektaflo" fixer, Hunt Graph-O-Lith Developer, and aluminum hydroxide. As at the X-ray facilities, fixer wastes have been put through a silver extraction system prior to combination with developer wastes, then diluted and discharged to the sewer system since 1955. All exposed film waste is collected and the silver in the film is recovered.

6.2.2.4 Environmental Test Laboratory. The WQEC environmental test laboratory is located in Building IA21. This facility is primarily used for the testing of material durability in adverse environments, such as salt spray or heat. It includes temperature conditioning systems, humidity ovens, and other dry laboratory testing instruments. The environmental test laboratory at NWS Concord has not been used much since 1976, when salt deterioration tests on steel were concluded. At that time the only waste generated was saltwater (20% NaCl), which was disposed of into the sewer system.

6.2.2.5 Materials Test Laboratory. The materials test laboratory at WQEC performs tests on the structural integrity and dynamics of ordnance casings, shells, and missiles. Extremely small amounts of wastes are generated at the laboratory, usually less than 100 pounds per year. These wastes are primarily composed of test fluids and steel, brass, and aluminum scraps and shavings. Currently, all such wastes are collected as solid wastes and disposed of off base.

6.2.3 Segregation Facilities. The segregation facilities (Buildings R1, R3, and R4), which are also collectively known as the R Area, are used to sort and inspect conventional ammunition that has been offloaded from ships returning from the Pacific.

Conventional ammunition is offloaded from the homeported AEs, transferred from the pier, and sorted and inspected in the R Area. It is then designated for disposition and transferred to a magazine or holding yard. Retrograde material is usually transferred to an inland depot for renovation (sandblasting, repainting, replacement, etc.), although, until 1977, large-scale renovation was done at NWS Concord (usually the Mare Island Annex) and constituted a major part of the weapon station's mission. Only minor maintenance such as painting and stenciling is now done in the R Area.

The R Area Disposal Site (Site 2) lies just to the east and alongside of Baker Street between the segregation facilities and the inert storehouses (see Figure 2-1). Wastes disposed of in this area include paints, paint cans, thinners, solvents, ordnance casings, and possibly ordnance. The disposal area is roughly 10 feet wide and 800 feet long (see Figure 6-1).

6.3 SUPPORT OPERATIONS AND TENANTS.

6.3.1 Safety Department. Since 1959, practice burns utilizing fuel oil have been conducted by NWS Concord fire department personnel. Between 1959 and 1969, these burns were done in an unlined burn pit located in the old EOD IA42 demolition area (Burning Area, Site 13). From 1969 to 1973, the burns were conducted in a shallow pit located south of the present fire station (Building IA7) on the banks of Seal Creek. Since 1973, the burns have been conducted in shallow metal pans behind the present fire station. Historically, these burns have been conducted twice a year. The IAS team was unable to determine where, if anywhere, practice burns were held prior to 1959; it is assumed they were held at the IA42 burn area.

Extinguisher chemicals used included potassium chloride, sodium chloride, ammonium phosphate, and potassium carbonate. Residues of these chemicals were left in the pit at the IA42 site between 1959 and 1969. However, between 1969 and 1973, they were scraped off the ground behind the fire station and disposed of in the bed of the Seal Creek (usually dry) which runs just to the south of the fire station. Since 1973, the chemical residues have been contained within pans and disposed of at approved sites.

6.3.2 Public Works Department. The Public Works Department at NWS Concord is responsible for a wide variety of operational, maintenance,

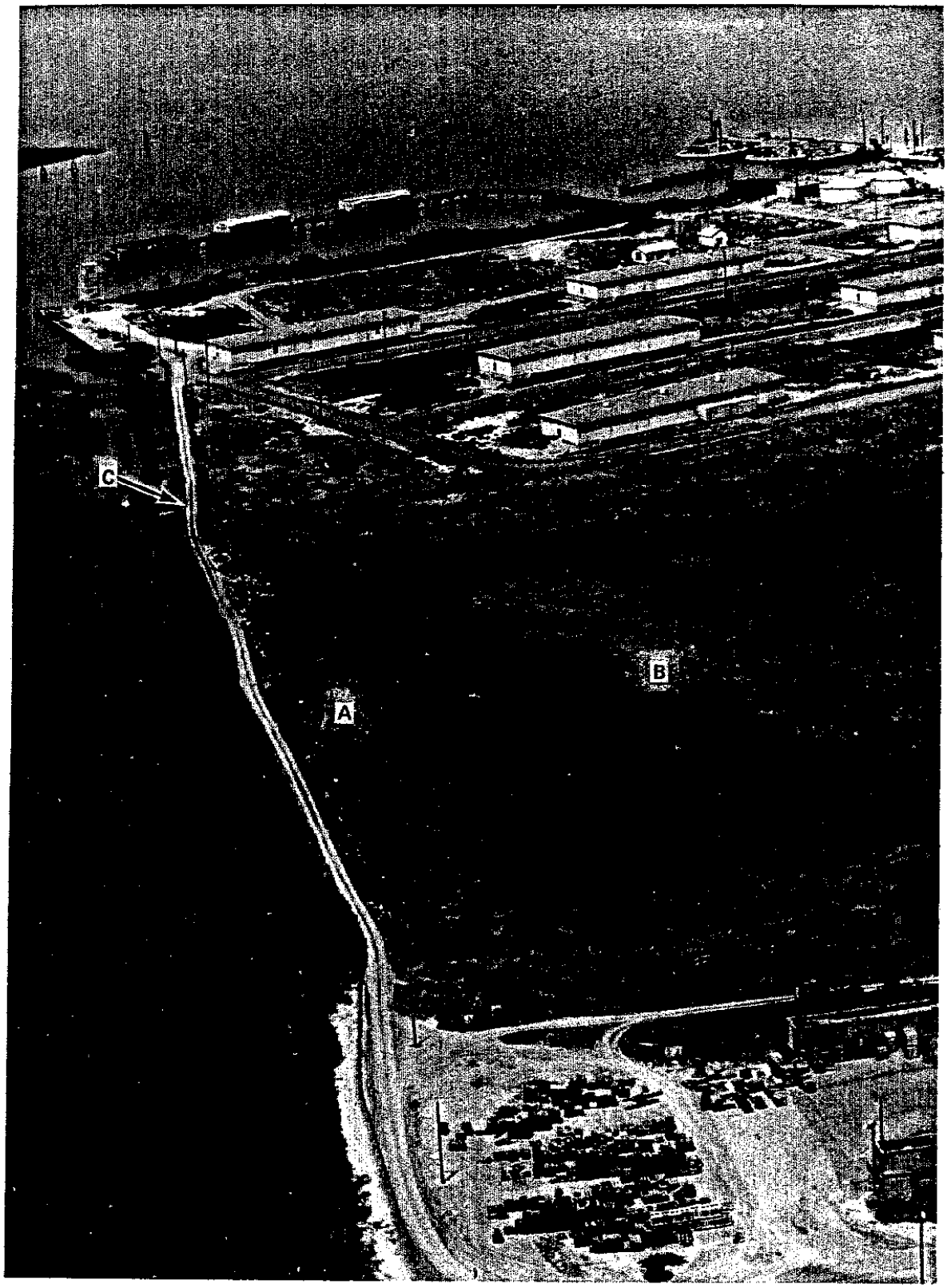


Figure 6–1 AERIAL VIEW OF THE TIDAL AREA, LOOKING NORTH
The R Area (munitions segregation) is located at the bottom of the photograph. The R Area Disposal Site (Site 2) is located at (A); (B) is a portion of the Tidal Area Landfill (Site 1). Water from the landfill washes over the road at (C) and runs into the canal (May 1982).

and repair activities at the base. As a result, it handles or generates a wide variety of hazardous materials and wastes. The largest quantities of these materials are handled by the Facilities Maintenance Division (Code 094) and the Transportation Division (Code 095).

6.3.2.1 Facilities Maintenance Division. The Facilities Maintenance Division operates all utility systems and provides maintenance services at the weapons station. Commonly known as the Shops Division, it includes the paint shop, electrical shop, and pest control shop.

Wastes from the paint shop consist of solvents, thinners, and empty paint cans. In the early history of the base, the shop was manned by approximately 15 to 25 painters who were responsible for most of the interior and exterior painting at the station. From interviews with station personnel, it was determined that most of the paint was oil-based and that much of the exterior paint contained lead. All waste paints, thinners, cans, etc., reportedly were disposed of in the Tidal Area Landfill. By the early 1960s the use of lead paint was significantly reduced, and latex-based paints began to be generally used in place of oil-based paints.

In the late 1960s, paint shop personnel was reduced to three painters responsible for touch-up and repair work and minor interior finishing. Major painting jobs are presently performed by contractors who are responsible for the cleanup and disposal of their materials. Paint usage by the paint shop was estimated at 700 gallons of paint (predominantly latex) per year, which generates approximately three drums of solid waste per year. This waste is discarded in a dumpster for pickup and disposal by an approved contractor. Latex paint washup water is poured directly into the sewer system.

Waste products regularly generated by the electrical shop consist primarily of negligible amounts of waste solvents and lubricants from the overhaul and repair of electrical equipment. However, the shop is responsible for the maintenance and disposition of five PCB-filled transformers on the station, four of which have been in service for approximately the past 15 years. These transformers are located at Piers 3 and 4, at Building 174, and at the IA54 substation. Each of them has a spill containment wall or drip pan with absorbent beads to contain any leaks. Evidence of small, slow, infrequent leakage (one or two drops per month) was observed in the drip pans of the Pier 3 and Building 174 transformers. However, base personnel report that these transformers are due for replacement within the next year.

An inactive PCB-containing transformer was removed from its Pier 2 location in early 1982. It is currently stored in a six-foot by six-foot box constructed of three-eighths-inch steel located in the hazardous waste compound south of IA46. It is scheduled to be moved in the near future to the IA54 substation compound, where a concrete pad and containment structure has been built for its storage.

In the past, contained PCB drippings and cleanup rags were deposited in a 12-inch projectile casing which was sealed and stored in the hazardous waste compound. Interviews with station personnel did not

indicate any evidence of inappropriate PCB disposal in the past. It was reported that a portable oil purifier may have been used in the vicinity of E82 in the Tidal Area prior to 1965, and that the soil in this area may be contaminated. However, no evidence or documentation was obtained to substantiate that claim.

The pest control shop is responsible for insect and rodent control in station buildings and on station property, as well as vegetation control along streets, sidewalks, and buildings. Large-scale vegetation control along roadsides and in pastureland is performed by contractors. Currently, the pesticides Dursban and Ficam are primarily used for insect control. Krovar I is used for weed control. Methyl bromide and poison bait are used to control ground squirrels and rodents. Contractors reportedly use Roundup for roadside weed control and aminotriazole and 2,4-D to control broadleaf vegetation. Table 6-1 gives an indication of the wide variety of pesticides and herbicides used by the shop.

The chemicals used in the pest control shop are stored in the pesticide shack located adjacent to IA46. Mixing is performed according to label instructions in the tanks from which they are then dispensed. Empty cans are triple-rinsed and the rinsings are also deposited in the spray tanks. The cans are then suitable for disposal as solid waste according to label directions. When changing tank contents, the rinsings are merely sprayed out as dilute applications of the pesticide or herbicide formerly in the tank. A sink in the pesticide shack is used primarily to provide water for pesticide mixing. However, it was reported that occasional spills of small amounts of materials or residuals on utensils may go down the drain.

A records review revealed the death of 11 head of cattle that had wandered onto the station through an open gate in 1947. The deaths were attributed to poisoning from sodium arsenate, which had been sprayed on the property as a herbicide. In 1966, an agricultural leasee complained of poisonous chemicals being spilled into a drain which flowed into his cattle grazing area. The Public Works Department acknowledged that chemical wastes from the pesticide shack were disposed of into an adjacent gutter on D Street which flowed toward the area in question. This was used to justify the installation of the drain from the shack into the sewer system.

6.3.2.2 Transportation Division. The Transportation Division is responsible for the maintenance of approximately 1,100 pieces of automotive, construction, railroad, and weight handling equipment. Heavy equipment cleaning is performed at the steam cleaning pad located west of Building IA12. Wastes are collected in a large concrete sump which is periodically cleaned by a contractor. Light steam cleaning is performed adjacent to IA51, where wastes are drained directly into the storm drain.

Up until the early 1960s, a zinc chromate rust inhibitor was added to motor antifreeze. At that time, waste antifreeze was disposed of by contractor. The change was made to a GSA-purchased antifreeze which was typically spilled onto the ground and into storm drains. Approximately five years ago, chromates were detected in Seal Creek. When it

Table 6-1

PESTICIDES COMMONLY USED AT NWS CONCORD

Common Name and EPA Number	Pest	Approximate Amount Ordered	Area
Dursban 464-343-ZA	Roaches, ants, and similar pests on label	25 gal	Galleys, clubs, and coffee messes
Propoxer (Baygon) 3125-121-ZA	Roaches, ants, and similar pests on label	10 lb	Galleys, clubs, and coffee messes
Pyrethrin	Roaches, ants, and similar pests on label	125 cn	Galleys, clubs, and coffee messes
Ficam W 10065-3-AA876	Roaches, ants, and similar pests on label	100 pg	Galleys, clubs, and coffee messes
Ramik Green 876-185-AA	Mice and rats	45 lb	Galleys, clubs, and coffee messes
Malathion 551-131	Flies and ants; mosquitoes	50 gal	Dumpsters; ditches, culverts, and standing water
Diazinon 4E 100-463-AA	Roaches, ants, fleas, lice, and similar pests on label	25 gal	Residential areas, including barracks and bachelor officers' quarters (BOQ)
Dichlorvos 2E 201-235	Roaches, ants, fleas, lice, and similar pests on label	2 gal	Residential areas, including barracks and BOQ
Chlordane 551-133	Termites	10 gal	Residential areas, including barracks and BOQ
Sevin 1016-43	Ants, sowbugs, and other pests in lawn	60 gal	Residential areas, including barracks and BOQ
Rozol 7173-113	Mice and rats	60 lb	Residential areas, including barracks and BOQ

Table 6-1 (Cont.)

Common Name and EPA Number	Pest	Approximate Amount Ordered	Area
Mesurol 5967-68-AA	Slugs and snails	50 lb	Ornamentals, turf, and ice plant
Diazinon 50W 100-460-AA	Earwigs, mites, and crickets	30 lb	Ornamentals, turf, and ice plant
2-4-D 7001-125-AA	Broad leaf weeds	1,000 lb	Ornamentals, turf, and ice plant
Benlate	Dutch elm disease and mildew	10 lb	Ornamentals, turf, and ice plant
Surflan 75W 1471-102	Weeds and grasses	25 lb	Ornamentals, turf, and ice plant
Tordon 22K 464-323-AA	Artichoke thistle and other weeds on label	50 gal	Magazine and grazing area
Tordon 10K 454-320-AA	Weeds	1,200 lb	Magazine and grazing area
Tebrithiuron (Spike 80W) 1471-97-AA	All weeds and grasses	200 lb	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks
2-4-D (Weedone) 264-20-AA	Broadleaf weeds	50 gal	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks
F Enac 264-139	Broadleaf weeds	300 gal	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks
Maleic Hydrazide (Retard) 6308-53	Broadleaf weeds	50 gal	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks
Diuron and Bromacil (Krovar I) 352-352-AA	All weeds and grasses	2,200 lb	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks

Table 6-1 (Cont.)

Common Name and EPA Number	Pest	Approximate Amount Ordered	Area
Aminotriazol 241-168-AA	All weeds and grasses	100 lb	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks
Atrazine 100-497-AA	All weeds and grasses	50 lb	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks
Pramitol 100-479-AZ	All weeds and grasses	80 lb	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks
Dowpon 164-402-AZ	All weeds and grasses	100 lb	Roads and railroad shoulders, fire hydrants, magazine vents, power poles, and fire breaks
Methyl Bromide 464-3-AA	Ground squirrels	75 lb	All outside station areas
Diphacin 876-50018-AA	Ground squirrels	100 lb	All outside station areas
Gopha-cide 1476-1	Gophers	50 lb	All outside station areas
Zinc Phosphide	Rats and mice	64 oz	All outside station areas
Carbaryl	Ants, sowbugs, and other pests on label	50 lb	Under buildings and quarters

Source: 1979-1980 Pest Management Plan.

was discovered that the new antifreeze contained zinc chromate, the type of antifreeze was changed and a biodegradable rust and scale inhibitor was added.

The division maintains a gas station near IA16 with two 10,000-gallon gasoline tanks and two 10,000-gallon diesel tanks located underground. Station personnel report that no tank leaks have ever been detected through routine level and volume checks. Small spills (one to two gallons) have occasionally occurred at the station, but these spills were confined to the immediate area of the asphalt pad.

Drainage of automotive and locomotive lead-acid batteries is performed at IA12. Battery acids are drained into a five-gallon carboy, which is then delivered to NSY Mare Island for recycling. The outside of the battery casings are rinsed and neutralized prior to disposal by DPDO. Approximately 40 automotive batteries are disposed of annually. It was estimated that 24 locomotive batteries have been disposed of in the past five years.

Building IA24 and the adjacent storage area IA24-A houses minor forklift maintenance operations and includes recharge facilities for expended forklift batteries. All solid wastes generated in IA24 were disposed of in the Tidal Area Landfill until 1978. These wastes included oily wastes, oil sludges from the collection sump, battery casings, rags, old parts and tools, and small amounts of cans containing paints and solvents. In 1971 it was reported that steam cleaning wastes of grease and oil from forklifts and batteries were discharged into an improperly operating catch basin. This reportedly resulted in oil contamination of an adjacent drainage ditch. The same report indicated that battery acid was disposed of on the ground directly behind the building. Navy sources reported that large amounts of battery acid were poured into a sump, but that this sump has not been used in 12 years. Personnel interviewed also stated that waste (dead) batteries (see Figure 6-2) were discarded directly into the dumpster at the rate of one per day.

6.3.3 Coast Guard Port Safety Section. The Coast Guard Section's primary responsibility is the cleanup of oil spills in the general San Francisco Bay Area; it has no function which relates specifically to NWS Concord. Section personnel told the IAS team that the Coast Guard Port Safety Section has not had the occasion to respond to any significant spills resulting from activities relating to the weapons station.

6.3.4 Naval Regional Medical Branch Clinic. The Naval Regional Medical Center (NRMC) Branch Clinic provides general outpatient clinical services to authorized active duty and retired military personnel, as well as eligible dependents. It also provides job-related and minor emergency services for civilian personnel on base. The NRMC facilities include an X-ray unit, a small laboratory, a pharmacy, and emergency facilities for ammunitions-related injuries.

The types and volumes of waste materials produced by the NRMC are limited. Wastes include small amounts of laboratory reagents and solvents, X-ray developing and fixing solutions, and solid, possibly

Figure 6–2 SPENT FORKLIFT BATTERIES, BUILDING IA24

infectious, wastes such as swabs, wound dressings, and used, empty, or out-of-date pharmaceutical containers.

Laboratory reagent and solvent wastes are limited to residuals in empty containers. These containers are discarded in plastic bags, placed into dumpsters for pickup, and disposed of by an approved contractor. All bacteriological plates, needles, and biological products are double wrapped in plastic bags and boxed for delivery to the Veterans Administration Hospital in Oakland or to NRMC-Oakland for incineration. X-ray solutions are produced in volumes less than 100 gallons per year and sent to NRMC-Oakland for silver recovery. Because the X-rays are electrically generated, no radiological wastes are produced by the facility.

6.3.5 Naval Regional Dental Center Branch Clinic. The Naval Regional Dental Center (NRDC) Branch Clinic provides dental care services for Navy and Marine Corps personnel, dependents, active duty members of other armed services, and retired military personnel. The NRDC also provides job-related and emergency services to civilian personnel at NWS Concord.

Wastes generated by the NRDC include small quantities of alcohol, chloroform, hydrogen peroxide, sodium hypochlorite, mercury, and X-ray solutions, most of which are produced in trace amounts and are either evaporated or disposed of down sink drains. Mercury is used in an approximate 50:50 ratio with metallic alloys to make dental amalgam. Excess amalgam may be discarded in the sink, but the volume lost is indeterminable. NRDC personnel estimate that approximately six to eight pounds of mercury are used annually, and as much as 25% of this may be discarded. However, during routine dental procedures, the discarded mercury is generally bound to the metallic alloy. Any excess mercury solution used in amalgam preparation is kept in stainless steel containers for reclamation by NRDC-Oakland.

X-ray films and solutions are currently recycled for recovery of their silver content. Approximately five gallons of waste X-ray fixer solution are produced every six months and delivered to NRDC-Oakland for silver recovery. This practice has been followed for at least the past five years. Reportedly, previous practice was to discard the solution directly into the drains. However, this was not substantiated by records or interviews of base personnel. Because the X-rays are electrically generated, no radiological wastes are produced.

6.3.6 Exchange Service Station. The Navy Exchange operates a service station in the industrial portion of the Inland Area. The station was constructed in 1967 and has not experienced any problems with underground gasoline storage tank leaks. Waste oils are and have always been kept in an underground 500-gallon tank. This is emptied on an as-needed basis by a local contractor.

6.3.7 Print Shop. The print shop has been in operation since NWS Concord first became operational. During this time it has been housed in several buildings located throughout the station. Shop machinery consists of two small offset machines and one Xerox machine. Shop

personnel wipe down ink rollers in the print shop by using a rag dipped into a solvent. Government issue, standard print shop solvent is benzene and methyl ethyl ketone. The rags were thrown into the regular trash; the solvent allegedly evaporates. During the Vietnam era the shop was much bigger and busier than at present; during World War II, operations were conducted on an even larger scale.

6.4 RADIOLOGICAL OPERATIONS. Operation and handling of radiation sources at NWS Concord are extremely limited. X-ray facilities located at the branch clinics of the Naval Regional Medical and Dental centers use electrically generated X-ray sources which do not generate any radiological wastes. Neither records searches nor interviews with station personnel indicated any past handling or disposal of radiological materials by the clinics.

The station's industrial X-ray facility was housed in IA58 until 1958, when it was moved to its present location at Pittsburg, California. The X-ray unit at this facility is also electrically generated; therefore, it produces no radiological wastes. Some low-level radiological sources are handled, however, by the WQEC materials test laboratory. This facility utilizes sealed radiation sources which are periodically leak tested. If the leak test produces a positive reading, the source is secured and returned directly to the manufacturer for repairs, or the manufacturer comes directly to the station, overpacks the source, and removes it from the station. This has occurred approximately two to three times since 1958. All leak-test swabs are read and disposed of by the contractor performing the task.

Another source of radiological material is depleted uranium from the disassembly of 20-millimeter penetrators. All materials coming into direct contact with the bare metal, including gloves and water from ultrasonic baths, have been stored in 55-gallon drums and shipped off to the Naval Supply Center-Oakland for transfer to an off-base disposal contractor since 1977. Between 1974 and 1977, there were two or three events during which water from the ultrasonic baths was disposed of down the drains. However, radiation surveys did not indicate any measurable emissions. The laboratory handles approximately 130 penetrators per year, generating approximately two 55-gallon drums of low-level wastes in the past five years. All faulty radioactive calibration sources are turned over to the manufacturer or to NAVELEX at NSY Mare Island.

6.5 HAZARDOUS MATERIALS STORAGE. Hazardous materials at NWS Concord include a variety of solvents, thinners, acids, and other solid and liquid materials used by the various station departments. The types of hazardous materials commonly used on the station are listed in Table 6-2. Management of hazardous materials and wastes is somewhat decentralized. Although formal hazardous materials/hazardous waste management falls under the purview of the Environmental Coordinator of the Public Works Department, each department has historically assumed primary responsibility for the storage and disposition of its own hazardous materials and wastes.

Aquisition and distribution of hazardous material begins at the station's Supply Department. These materials may be checked through the

Table 6-2

HAZARDOUS MATERIALS COMMONLY IN SHOP USE
AT NWS CONCORD

Acids

Sulfuric acid

Nitric acid

Hydrochloric acid (muriatic)

Caustics

Sodium hydroxide

Potassium hydroxide

Oxidizers

Chlorine gas

Chlorine evolving chemicals (e.g., calcium hypochlorite)

Sodium nitrite

Hydrogen peroxide

Reactives

Oxygen (also classified as general type HM)

Acetylene

Ammonium nitrate (also classified as oxidizer)

General

Oxygen (also reactive)

Mercury wastes

Pesticide wastes

Paint (mists, sludges, and residues)

Sodium cyanide

Organics

Trichloroethane

Isopropyl alcohol; other alcohols

Toluene, benzene, xylene

Fluorocarbons (Freons)

Oils and greases (petroleum based)

Turpentine

Lacquer thinners (except synthetic)

Resins

Adhesives

Dry-cleaning solvents

Degreasers

Acetone and other ketones (methyl ethyl ketone)

Oil-based paints

Monoethanolamine

Pentachlorophenol (PCP)

central clearinghouse at IA5 and then stored in the various Supply Department hazardous materials storage buildings and lockers throughout the station (e.g., Buildings 115, 38, and 43). Alternatively, the hazardous materials may be directly delivered to or picked up by a department for storage at the shop site, with the Supply Department monitoring records of the transfer. Therefore, accountability of hazardous materials extends to the shop level, with materials drawn from the various shop stores at different rates. Labeling of hazardous materials is performed by the vendor prior to shipment, or may be applied to packages by the Supply Department based on characterizations made by the Safety Department before processing procurement requests for potentially hazardous items.

NWS Concord currently holds an interim permit from the EPA for hazardous waste storage, transportation, and disposal. The Public Works Department has recently secured an area south of IA46, along D Street, for segregated storage of hazardous materials.

6.6 WASTE DISPOSAL. Current waste disposal at NWS Concord is performed primarily by private contractors in accordance with state and federal law. Solid wastes from the various shops are usually deposited into a dumpster for off-base disposal by contractor. Approximately 2,000 cubic yards of solid wastes are collected monthly. Waste oils are collected by the work centers and deposited in the Public Works collection tank for recycling through the railroad maintenance operations. Waste oils and chemicals from WQEC are collected in segregated 55-gallon drums which are disposed of by Supply Department contract when filled.

Municipal sewage from collection and holding tanks aboard ships is piped directly into the City of Concord municipal sewage system. Garbage is steamed at 212°F at the Tidal Area in an approved chamber to fulfill California requirements regarding the disposal of potentially contaminated foreign garbage. This waste is then disposed of by contractor at a sanitary landfill off base.

The disposal of wastes by contractor is a fairly recent practice. As recently as 1978, most of the waste materials generated at NWS Concord were buried on base. The largest disposal area was the Tidal Area Landfill (Site 1) located west of Johnson Road, between Buildings A20 and A31. This area was the primary disposal site for station wastes from the mid-1940s until its use was discontinued in 1979. Although described on maps as a sanitary landfill, the Tidal Area Landfill reportedly received wastes from virtually all station activities. Wastes disposed of there included paint cans, acids, creosote-treated timbers, asphalt, concrete, ordnance wastes, asbestos, waste solvents, residues from the ordnance burning pit, and waste oils (see Figure 6-3).

The landfill lies in the tidal marsh with portions completely submerged. The wastes deposited in the landfill were covered only occasionally; the most apparent cover on the landfill is wood chips from the wood hogger operation. An estimated total of 33,000 tons of waste have been disposed of in the landfill, which is approximately 100 acres in extent. In addition to the industrial wastes, shipboard

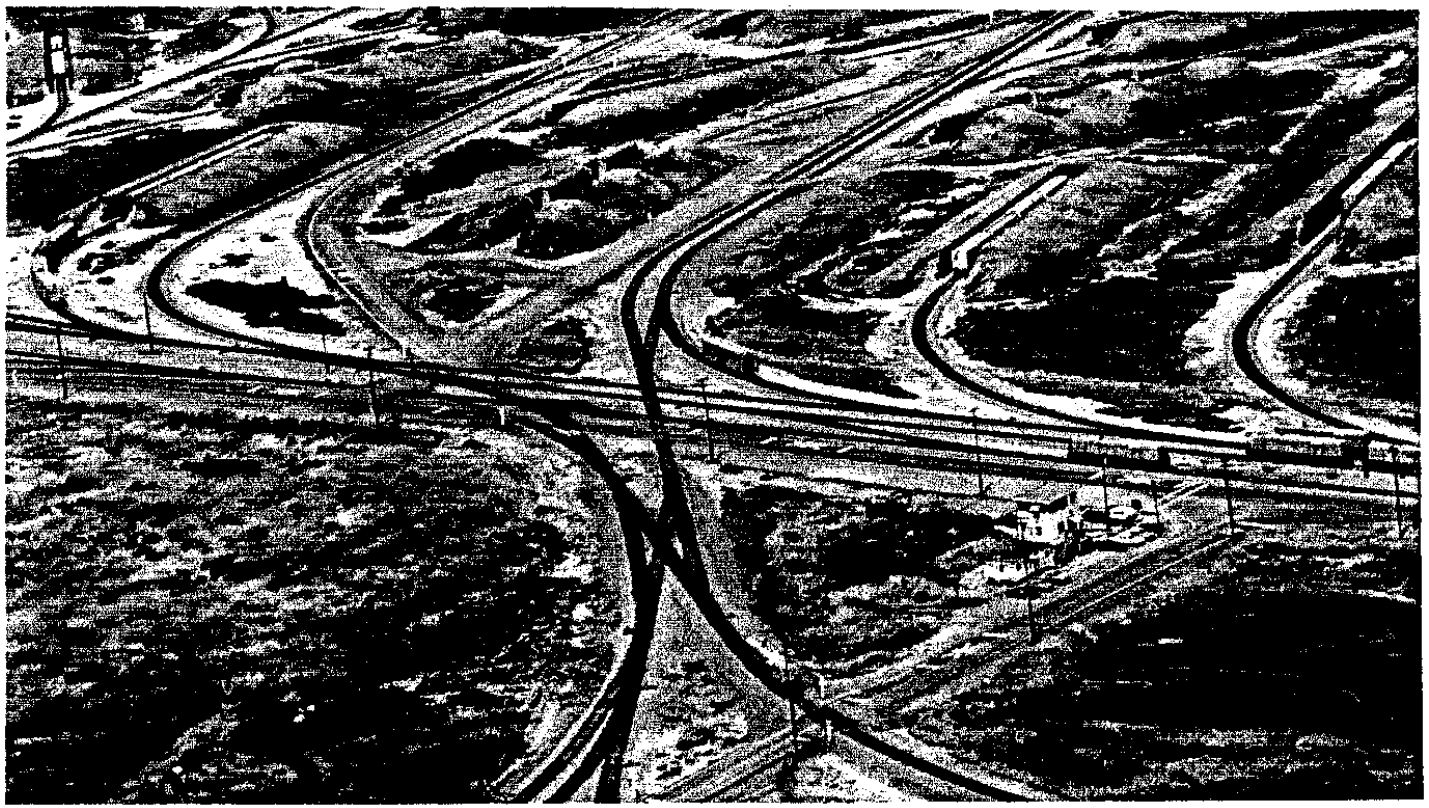


Figure 6–3 AERIAL VIEW OF TIDAL AREA, LOOKING NORTHEAST
The Tidal Area Landfill (Site 1) is in the lower left-hand corner of the photograph, bordered by the railroad and road. The Froid and Taylor Road Disposal Area (Site 9) is in the lower right-hand corner of the photograph, bordered by the road and railroad (May 1982).

waste, household garbage, and munitions have allegedly been buried in the landfill.

Disposal on base was not restricted to the Tidal Area Landfill. The Froid and Taylor Road Disposal Area (Site 9) has obviously been used as a disposal area (see Figures 6-4 and 6-5), as well as the R Area Disposal Site (see Figure 6-1). Both these areas are in proximity to the Tidal Area Landfill, and should be considered as adjuncts to the landfill. The Froid and Taylor Road Disposal Area (Site 9) consists of an area approximately 50 cubic yards in extent. Expended ordnance rounds, strapping and packing material, ordnance shipping containers, and metallic debris were all found in the area. A small tidal creek, which is subject to tidal fluctuation, runs through the area.

The R Area Disposal Site (Site 2) has been used for 30 years for the disposal of wastes generated at the Segregation Area. Wastes disposed of here have included ordnance shipping and packaging material, cannisters, cartridge casings, spent ordnance (suspected, not confirmed), and general trash and garbage. The majority of the material is underwater in the tidal marsh. Enough waste has been deposited so that some parts of the disposal area have been raised above water level. The depth of the tidal marsh in this area has been estimated at five to 15 feet; the total volume of waste disposed of amounts to between 500 and 1,600 tons of waste. A figure of 650 tons has been used throughout this report.

Other areas that have apparently been used as disposal areas, although not necessarily for the disposal of hazardous materials, include the Seal Creek Disposal Area (Site 19; see Figure 6-6), the Old Homestead at Seal Creek (Site 20; see Figure 6-7), the Black Pit at Red Rock (Site 16; see Figure 6-8), and the Railroad Classification Yard (Site 15; see Figure 6-9).

The Seal Creek Disposal Area (Site 19) consists of material (asphalt, concrete, and construction rubble) disposed of on the banks of the creek in the 1960s, and material washing out from the face of the creek bed. The site was used for a short period of time (estimated by interviewees as three years) in the 1960s for disposal of construction debris. This accounts for the material on the bank and in the creek bed face.

The Old Homestead Site (Site 20) apparently resulted from the use of a gully as a disposal area for one of the ranches located in the area prior to its being accessed by the Navy in 1943. The debris in the gully includes old bottles, kitchen and household implements, cans, and other trash. Some of the bottles were dated from the 1920s; the kitchen implements are similar to items used in the earlier part of this century. No hazardous materials were apparent in the gully.

The Black Pit at Red Rock (Site 16) is obviously a disposal area. The presence of bones, bottles, and other debris suggest that the pit may have been used as a disposal area by a rancher. However, no ranches or other structures, other than a shallow well, have ever been identified in this area. The pit is extensive in area, about 15 feet by 10 feet wide. Moreover, the pit's surface is sunk in about five feet

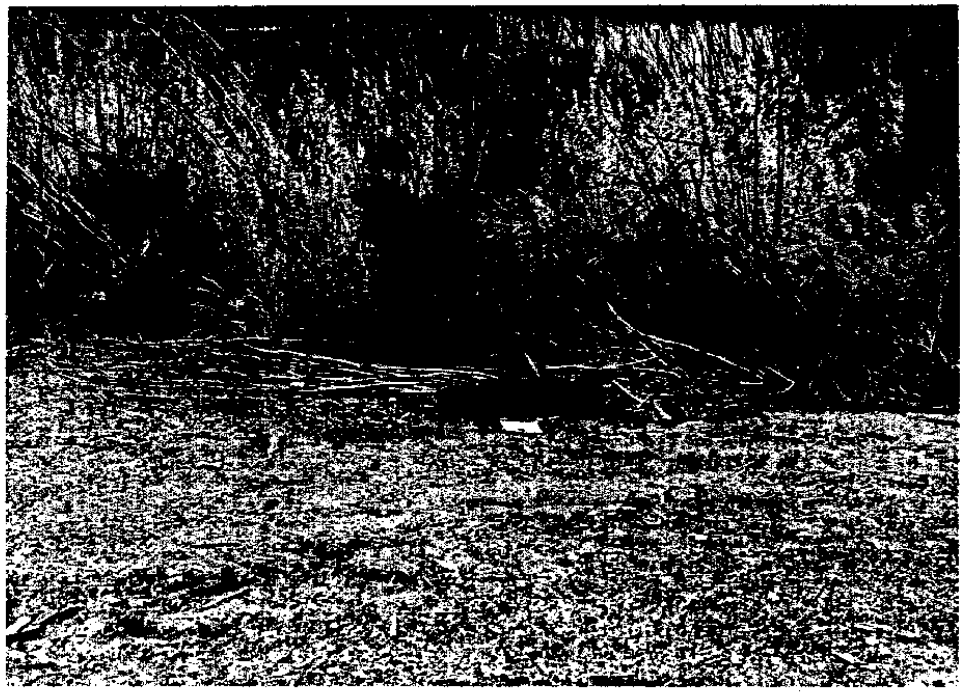


Figure 6–4 FROID AND TAYLOR ROAD DISPOSAL AREA (SITE 9)
This inert projectile, tentatively identified as a five-inch rocket warhead, was lying on the shoulder of Froid Road and led to the discovery of the Froid and Taylor Road Disposal Area (June 1982).

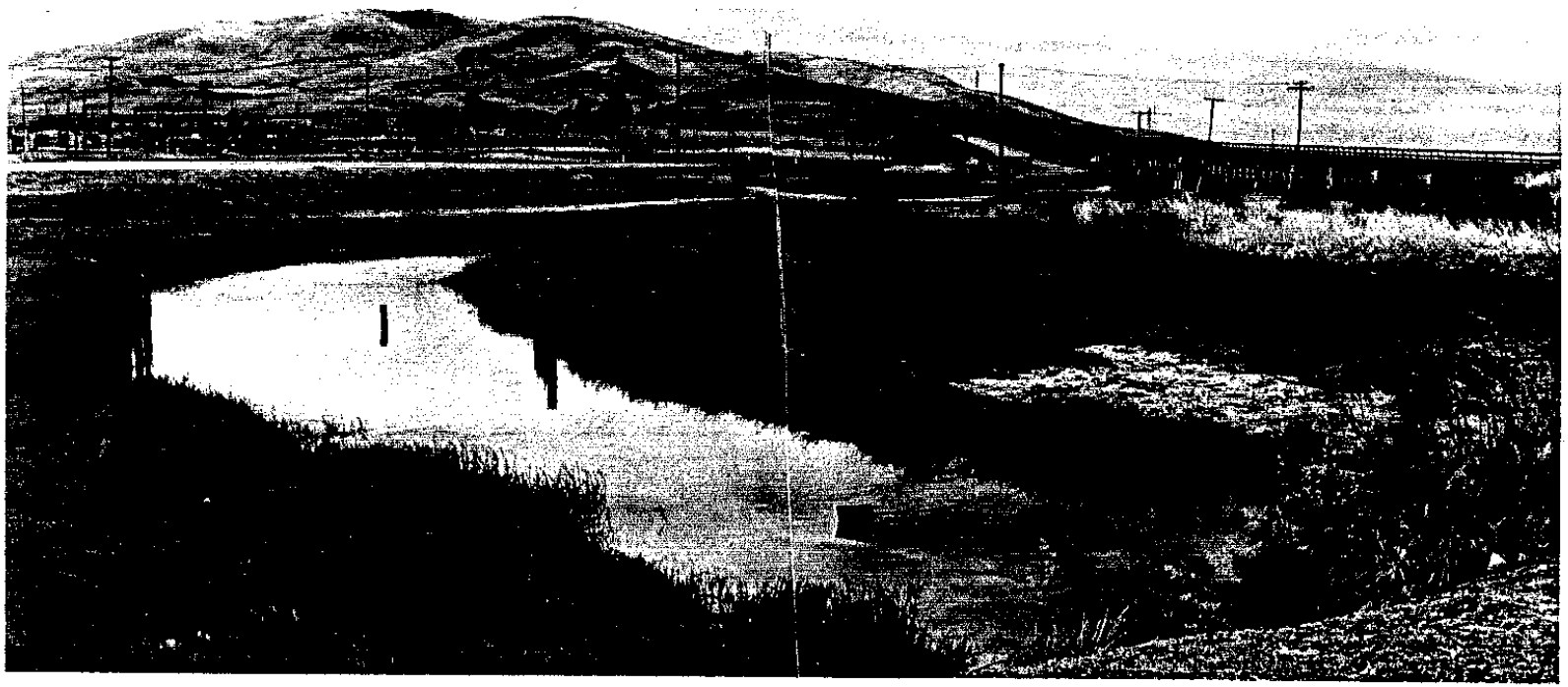


Figure 6–5 FROID AND TAYLOR ROAD DISPOSAL AREA (SITE 9), LOOKING SOUTH

The projectile in Figure 6–4 was found at the lower right-hand corner of the photograph. The bare area on the right bank of the stream has wood and metal debris. The brownish area on the left bank in the mid-foreground also has metal debris (June 1982).

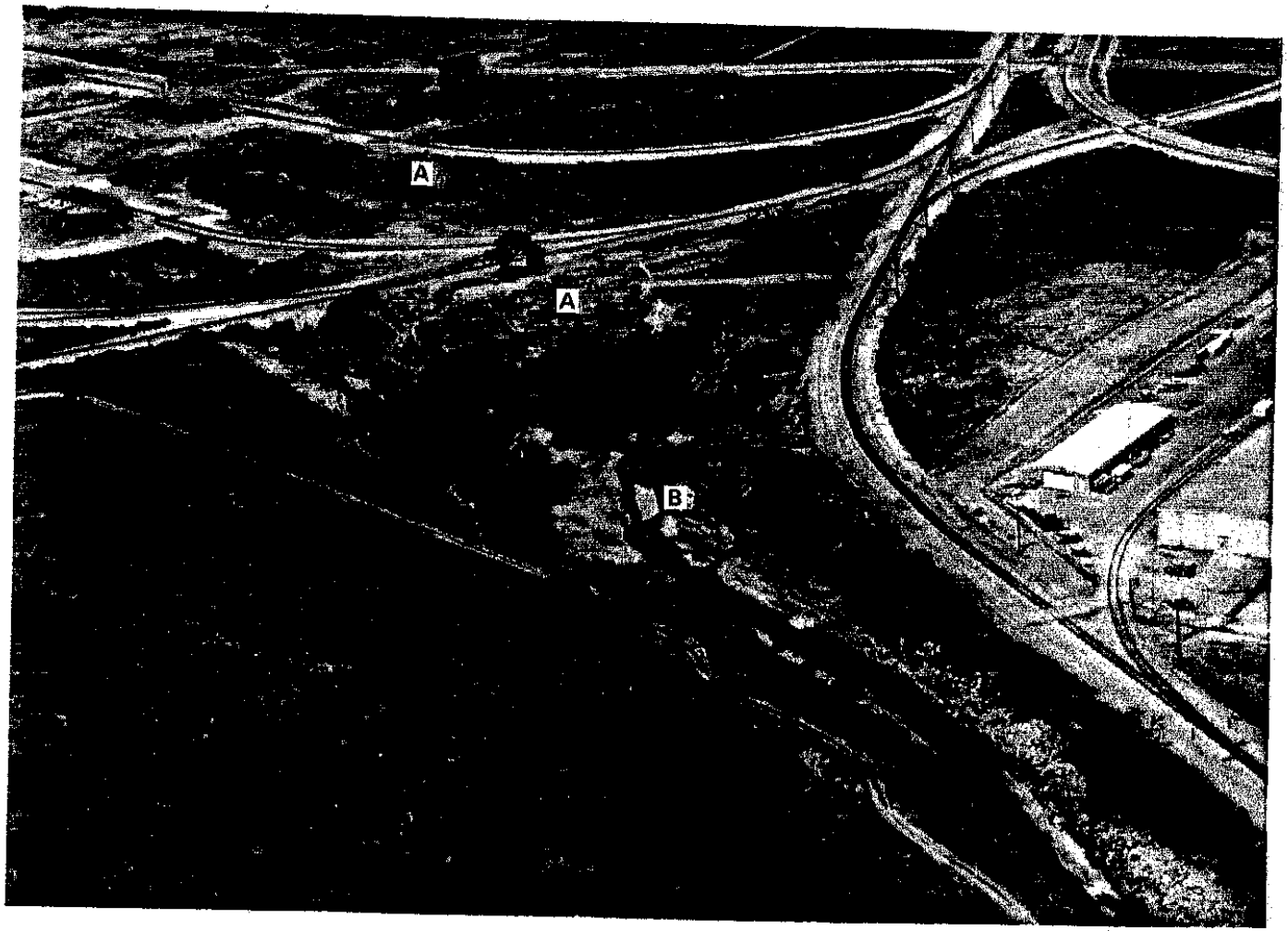


Figure 6–6 AERIAL VIEW, SEAL CREEK DISPOSAL AREA (SITE 19), LOOKING NORTH

(A) marks area where rubble, asphalt, and construction debris have been discarded.
(B) marks where drums and other material have accumulated (May 1982).

Figure 6–7 OLD HOMESTEAD, SEAL CREEK (SITE 20)
This gully leading to Seal Creek is filled with cans, coffee pots, bed pans, and other household trash, possibly from an old homestead (June 1982).

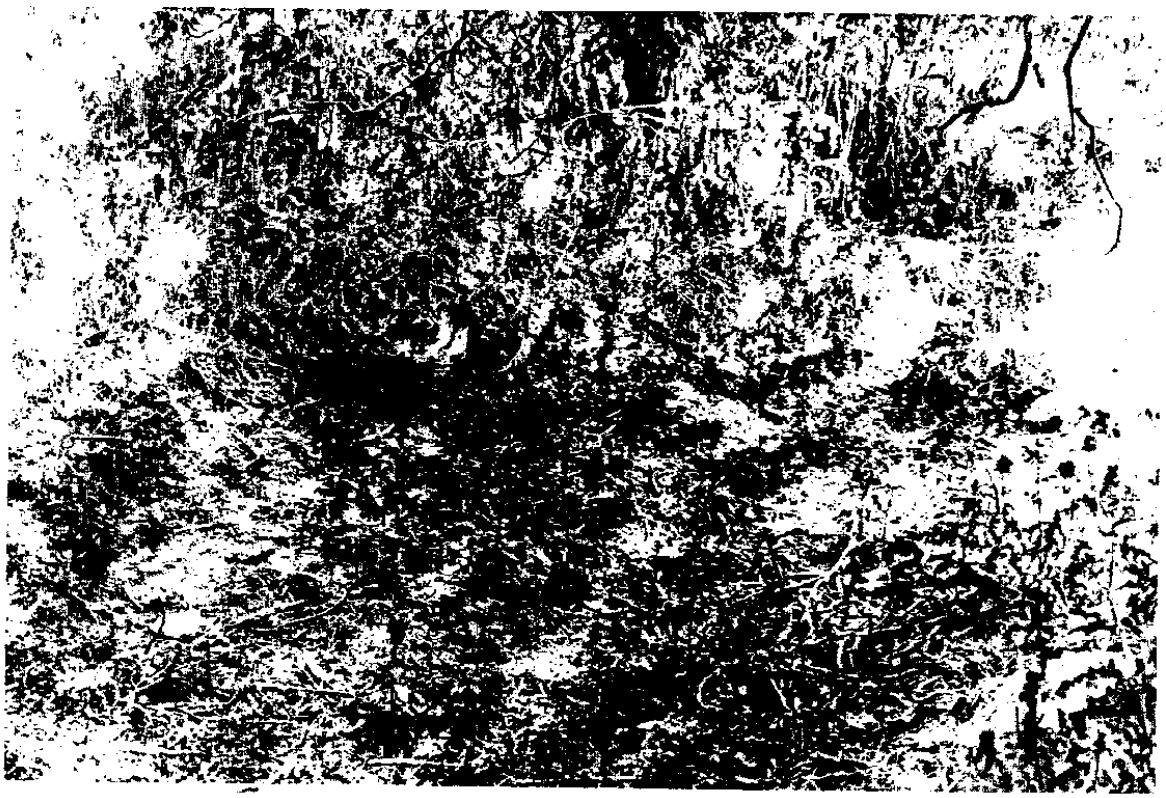


Figure 6–8 THE BLACK PIT AT RED ROCK (SITE 16)
Note the stressed vegetation, the sunken soil surface, the different soil color (part of the dark soil in the right hand of the photograph is lost in the glare), and the bones to the left of center of the photograph (June 1982).

Figure 6–9 RAILROAD CLASSIFICATION YARD (SITE 15)

The top photograph shows the three-inch, 20-millimeter, and 50-caliber casings found at the eastern end of the northern barricade. The bottom photograph shows the remains of one of the four methyl bromide-filled vials found on the northern face of the southern barricade (June 1982).

below the surrounding ground surface. Sampling and analyses of the pit conducted by NWS Concord personnel revealed the presence of heavy metals. The pit apparently has been used for the disposal of plating and other wastes.

Hazardous materials were present at the Railroad Classification Yard (Site 15). However, the materials consisted of a rodenticide (methyl bromide) that has been in common use on the base since 1954, and a small collection of shell casings in the 20-millimeter, .50-caliber, and three-inch range. The methyl bromide vials were disposed of. A thorough search of the berms at this site failed to reveal any more vials, broken or unbroken. The IAS team determined that the vials had either been thrown out of boxcars that had been treated with the rodenticide, or they had been used against ground squirrels found in the berm itself and had later washed out.

One disposal site that has been demonstrated to contain hazardous material is Site 6, the Coke Pile Site (see Figure 6-10). The results of an analysis conducted in 1981 are contained in Table 6-3. The piles of spent coke are stable (i.e., little movement from erosion has been noted), and test results to date show only limited migration of the contaminants. Vegetation on the site has been suppressed by the presence of the coke, apparently more from the smothering of the roots than from the effects of contamination.

The Kiln Site (Site 3), Allied Sites A and B (Sites 4 and 5), the K-2 Area (Site 25), and the G-1 Area (Site 26) have also been determined to be areas of significant contamination resulting from past disposal practices (see Figure 6-11). An analysis of samples taken in 1981 is contained in Table 6-4. The Kiln Site had several brick kilns located at the site until 1974. Their appearance indicated that they have not been used for a number of years. They have been almost completely dismantled by brick scavengers, and only remnants now remain. Little is known concerning the ownership of the kilns and the processes for which they were used.

Site A (Site 4) comprises a marshy area several acres in size adjacent to the northwest portion of the Allied property. Samples collected by the California Department of Fish and Game in the fall of 1976 showed contamination of marsh water due to low pH runoff, possibly from the Allied Chemical plant's hydrofluoric acid recycle system ponds and, possibly, from the alum mud and iron oxide that covers most of the northern portion of the property.

In late 1976, the California Regional Water Quality Control Board issued a Cleanup and Abatement Order (No. 76-020) to the Allied Chemical Company to "prevent continued discharges of toxic wastewaters to State waters." In early 1977, to comply with the order, Allied Chemical conducted soil sampling on its own property as well as on NWS Concord property to identify the extent of contamination. The company then scraped approximately 7,800 cubic yards of contaminated soils and placed them behind a dike constructed along its northwest property line to control runoff. However, sampling by NWS Concord personnel in November 1980 and April 1981 showed significant levels of copper, iron, zinc, cadmium, and lead; a low pH in one sample was also found.

Figure 6–10 COKE PILES (SITE 6), LOOKING NORTH
Note the absence of vegetation, the metal scrap mixed with the spent coke, and the marsh immediately to the right (June 1982).

Table 6-3

COKE PILE (SITE 6)
ANALYTICAL RESULTS

Sample	pH	Arsenic (ppm)	Lead (ppm)	Selenium (ppm)	Tellurium (ppm)
Coke pile	2.1	23	270	2100	2800
Coke pile	2.2	24	280	2600	3200
Coke pile	2.8	27	230	0.51	2700
Soil	4.7	10	200	14	72
Soil	4.0	26	170	11	25
Soil (sand)	4.8	28	270	6.9	8.6
Water*	7.8	.01	<.01	<.01	.006
Water	7.0	.04	.02	.13	.06
Water	6.6	.08	.02	.08	.16
Water	7.0	<.01	.01	<0.1	.01

*Water samples collected from the west end of an adjacent marsh area (2) and from the discharge culvert at east end of marsh (2).

Source: Environmental Research Group, Inc., Project 840; Reported in communication to David Sikes, NWS Concord, April 7, 1981.

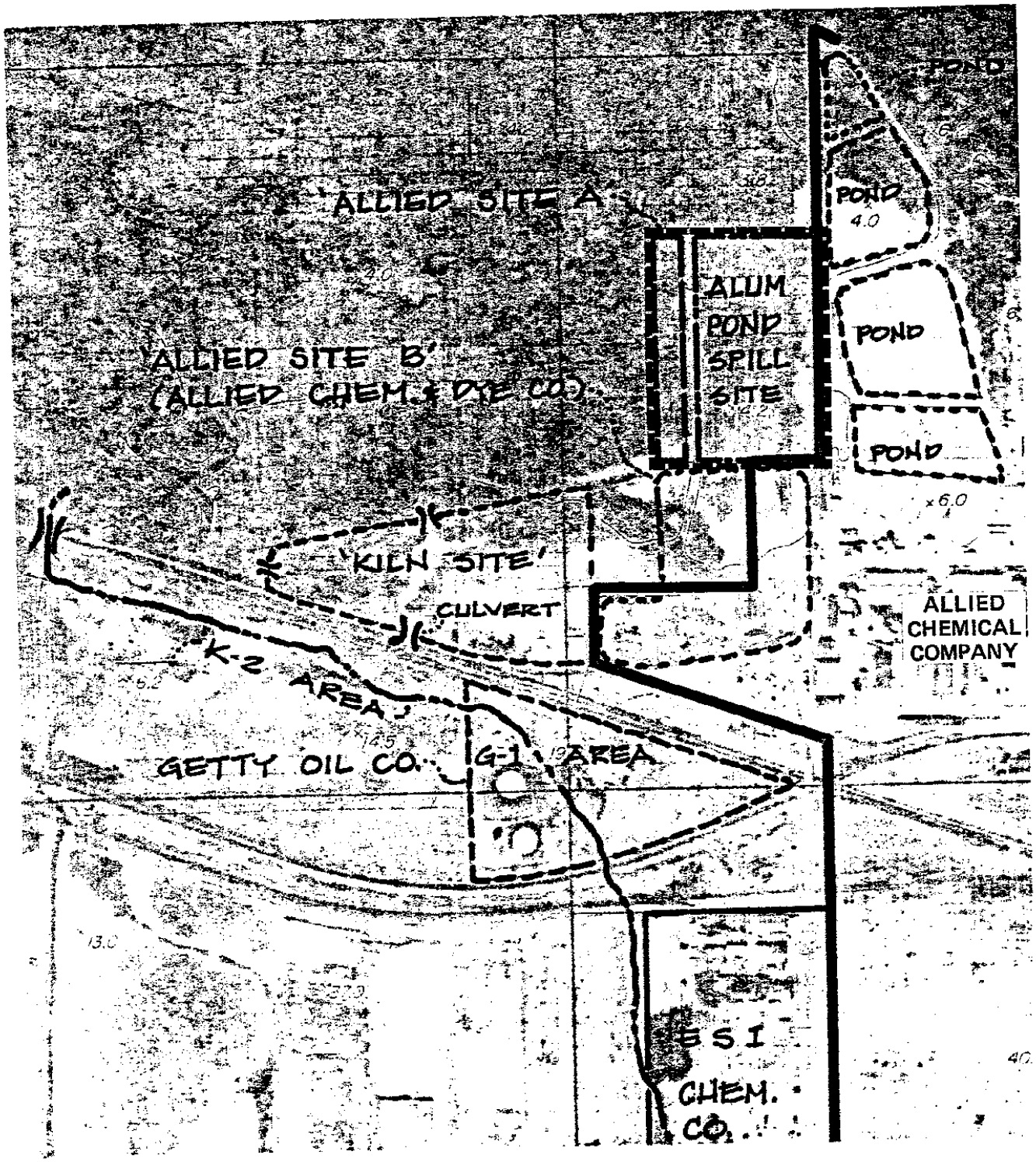


Figure 6–11 KILN SITE (SITE 3), ALLIED SITES A AND B (SITES 4 AND 5), K-2 AREA (SITE 25), and G-1 AREA (SITE 26)

Table 6-4

RESULTS OF SAMPLE ANALYSES AT
ALLIED CHEMICAL SITE A (SITE 4)

Sample	pH	Arsenic (ppm)	Cadmium (ppm)	Copper (ppm)
Soil	5.3	34	9.2	1100
Soil	5.5	360	8.0	1100
Soil	5.0	360	6.9	500
Soil	4.6	150	6.7	305
Soil	6.7	33	8.1	110

Source: NWS Concord, Public Works Center.

As with Site A, Site B (Site 5) was determined by the California Water Quality Control Board in 1976 to be contaminated with low pH runoff, possibly from the Allied Chemical facility. As part of its program to comply with the Cleanup and Abatement Order issued at the time, in early 1977 Allied Chemical applied agricultural lime to the approximately eight acres of NWS Concord property that comprise Site B. Allied Chemical then extended the dike constructed near Site A southward along its western boundary to prevent further runoff into Site B.

Although there was no indication that low pH contaminated runoff has adversely affected the environmental quality of Site B since the application of lime in 1977, soil samples collected in 1980 in an area of Site B near the southern limit of the Allied Chemical property (presumed to be an old railroad wash facility) revealed the presence of heavy metals. The study revealed high levels of zinc (974 ppm), iron (67,800 ppm), and copper (185 ppm) in soil samples collected at the southern portion of Site B close to the Southern Pacific railroad tracks. No other sampling efforts have been conducted to monitor the effectiveness of lime application in the Site B area.

The K-2 Area (Site 25) and G-1 Area (Site 26) have both been sampled by NWS Concord personnel. Analysis has confirmed the presence of contamination, particularly zinc and copper. The G-1 Area is a Getty Oil Refinery that was acquired by NWS Concord. The K-2 Area has apparently been contaminated by runoff from the G-1 Area, or possibly the ESI Chemical Company plant. The Kiln Site (Site 3) could also have been contaminated by these two areas, since the small stream that traversed the ESI Chemical Company plant and G-1 Area sites emptied at one time into the Kiln Site.

Other than the Tidal Area Landfill (Site 1), the Burning Area (Site 13; see Figures 6-12 through 6-15) represents possibly the most extensive disposal area at NWS Concord. This area consisted of an unlined burn pit (Building IA53), a popping oven, several dumpsters used for the disposal of thermite grenades, and several areas used for open air burning. The items disposed of here included over 250 tons of powder, thousands of flares, photoflash cartridges, and naplam bombs. Remnants of the disposal area are still evident; the IAS team overturned a piece of casing that had a black crystalline substance still attached to the casing wall.

In addition, in 1947 "a large quantity of FS smoke chemicals" was disposed of in the vicinity of this site in a trench eight feet deep, four feet wide, and 30 feet long. Degradation of these chemicals will produce sulfuric acid and hydrochloric acid, which could contaminate groundwater.

Table 6-5 provides a listing of ordnance items and their constituents disposed of at the burning area.

Vegetation in the burning area is depressed and the soil surface is sunken. Debris, some with a black crystalline surface attached, is plainly visible.

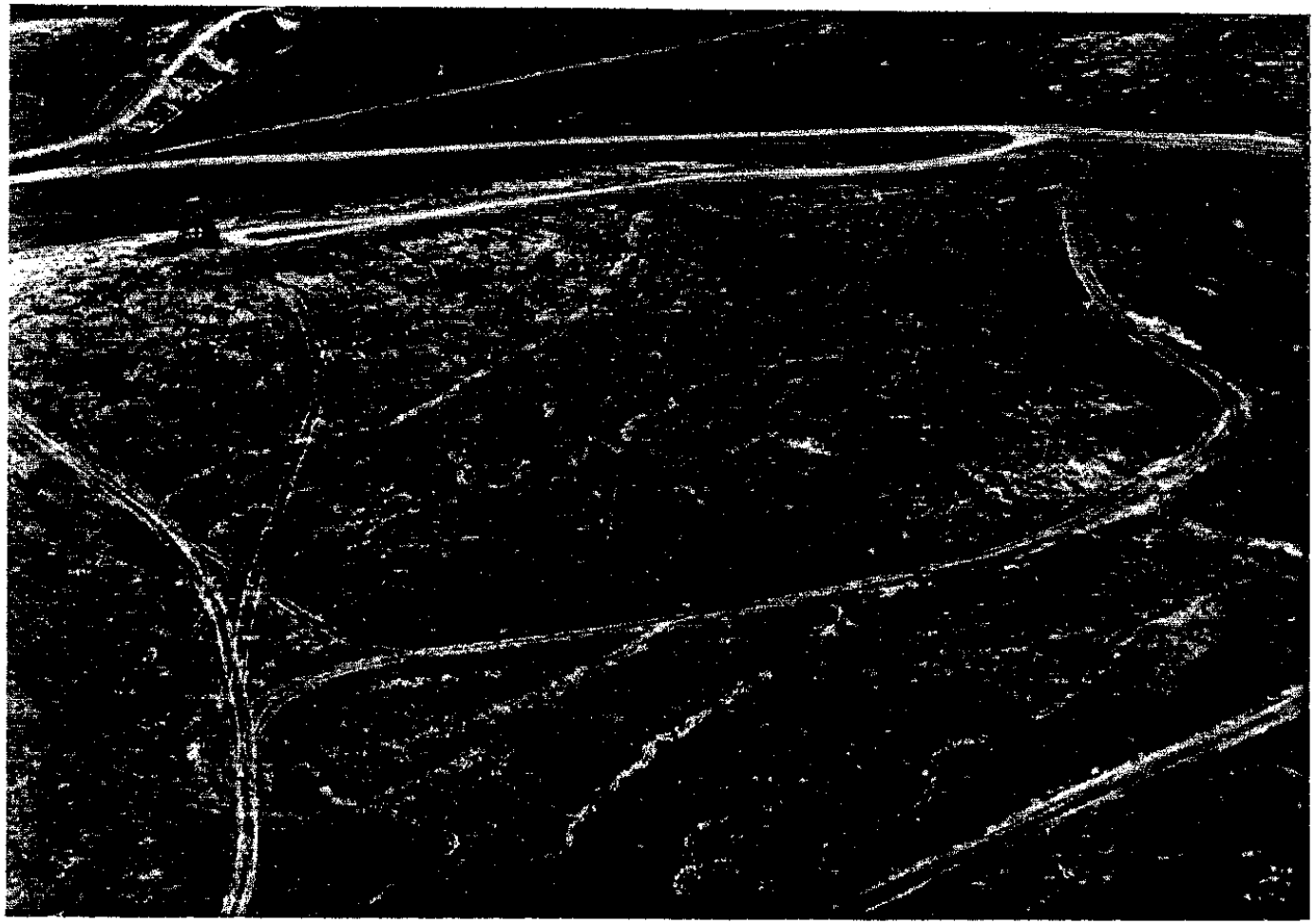


Figure 6–12 AERIAL VIEW, BURNING AREA (SITE 13), LOOKING NORTHEAST
The entire hillside below the fire tower has been used for ordnance disposal (May 1982).

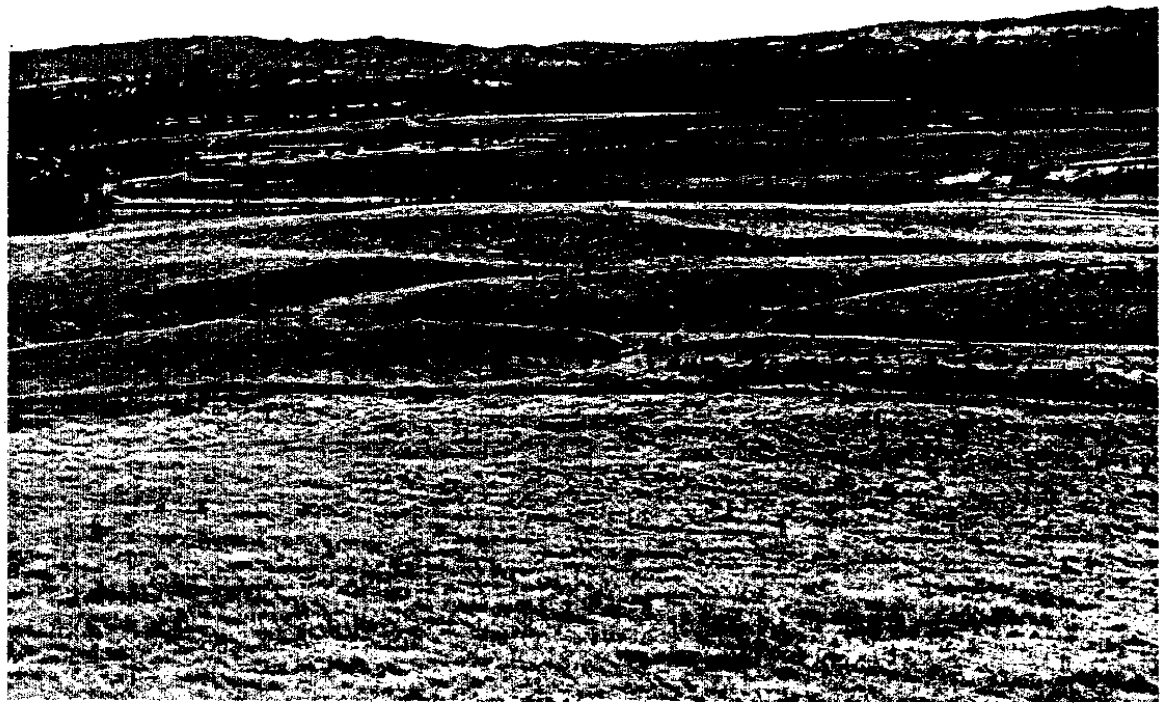


Figure 6–13 BURNING AREA (SITE 13), LOOKING SOUTH FROM THE VICINITY OF THE FIRE TOWER

The ravines in the middle of the photograph were used for burning napalm, flares, powder, and five-inch rocket motors (June 1982).

Figure 6–14 BURNING AREA (SITE 13), LOOKING EAST
The depressed vegetation and sunken soil surface are plainly visible (June 1982).

Figure 6–15 DEBRIS IN THE BURNING AREA (SITE 13)
The bottom photograph shows a black crystalline substance attached to the scrap metal.

Table 6-5

ORDNANCE ITEMS DISPOSED OF AT THE BURNING AREA (SITE 13)

Item	Ingredient
Mk 1 Flare	
Navy light, red	• Potassium chlorate • Sugar • Binder • Methylaminoanthraquinone • Potassium bicarbonate
Navy light, blue	• Potassium chlorate • Copper ammonium sulfate • Cupric oxide • Copper powder • Arsenic trisulfide • Shellac
Marine signal, green	• Barium chlorate • Shellac • Dextrin • Rosin
Marine signal, red	• Potassium chlorate • Strontium carbonate • Shellac • Dextrin
MK 13 Flare	
Marine signal, flare	• Strontium nitrate • Potassium perchlorate • Hexachlorobenzene • Magnesium powder • Gilsonite
Marine signal, smoke	• HV Orange B • Potassium chlorate • Sucrose • Graphite
Five-Inch Rockets	• Nitrocellulose • Nitroglycerin • Lead (organic salt) • 2-nitrodiphenylamine • Phthalate ester (ethyl or butyl) • Ethylcellulose (inhibitor)
Black Powder	• Charcoal • Sulfur • Saltpeter
Smokeless Powder	• Nitrocellulose • Diphenylamine
Napalm	• Alum • Gasoline • Coconut fatty acid • Naphthenic acid • Oleic acid
Photoflash Powder	• Aluminum • Magnesium • Potassium perchlorate • Barium nitrate

CHAPTER 7. BIBLIOGRAPHY

Army-Navy Explosives Safety Board, The Port Chicago, California Ship Explosion of 17 July 1944, Technical Paper No. 6, AD223346.

Becker, Dennis, 1982, personal communication, California Department of Fish and Game, Yountville, California.

Engeo, Inc., June 1979, B.E.Q. Project, Concord Naval Weapons Station, Concord, California, Geotechnical Exploration, Berkeley, California.

Grass, Allan, 1982, personal communication, California Department of Fish and Game, Yountville, California.

Kato, Susumu, 1982, personal communication, National Marine Fisheries Service, Tiburon, California.

Moore and Taber Northern California, February 1979, Subsurface Soils Study, Railroad Classification Yard, Naval Weapons Station, Concord, California, Sacramento, California.

Navy, Department of, November 1979, Annual Pest Management Plan: Naval Weapons Station, Concord, California, Concord, California.

Navy, Department of, June 1980, Abandoned Chemical Waste Disposal Site Survey, Concord, California.

Navy, Department of, June 1980, Naval Weapons Station Concord, California, Hazardous Wastes/Hazardous Materials Survey, Concord, California.

Navy, Department of, August 1980, Hazardous Material Management Survey Naval Weapons Station, Concord, California, Concord, California.

Navy, Department of, September 1980, Oil Spill Prevention Control and Countermeasure Plan, Naval Weapons Station, Concord, California, Concord, California.

Navy, Department of, January 1981, Navy Shore Activity Disposal Site Fact Form, Concord, California.

Navy, Department of, December 1981, Hazardous Materials/Hazardous Waste Management Plan, Concord, California.

Navy, Department of, Aerial Photos 1946, 1950, 1958, 1968, Concord, California.

Navy, Department of, Environmental Protection Data Base Reconnaissance, Concord, California.

Navy, Department of, Environmental Branch Official Correspondence Files, Activity Files Volumes 1 and 2, NWS Concord, Concord, California.

Navy, Department of, Naval Weapons Station, Concord, June 1980, Hazardous Wastes/Hazardous Materials Survey.

Navy, Department of, Naval Energy and Environmental Support Activity, June 1981, Environmental Status Report for Naval Weapons Station, Concord, California, Port Hueneme, California.

Navy, Department of, Naval Energy and Environmental Support Activity, June 1981, Survey of Environmental Data at Naval Weapons Station, Concord, California, Port Hueneme, California.

Navy, Department of, Naval Facilities Engineering Command Western Division (WESTDIV), June 1978, Geotechnical Investigation for Physical Security Facility, P-199, Naval Weapons Station, Concord, California.

Navy, Department of, Naval Facilities Engineering Command, Western Division (WESTDIV), October 1979, Naval Weapons Station, Concord, California, Master Plan, San Bruno, California.

Navy, Department of, Naval Facilities Engineering Command (NAVFACENGCOM), June 1967, The Port Chicago Story, San Bruno, California.

Navy Department of, Navy History Office, Washington Navy Yard, Command Histories, 1945-1980; War Diaries, 1941-1946; Wartime Histories, Vols. I-V, Washington, D.C.

Resources Engineering and Management, Consulting Engineers, March 1976, Environmental Engineering Survey, Naval Weapons Station, Concord, California, San Francisco, California.

Snyder, P.J., and J.H. Stratman, February 1971, Air and Water Pollution Survey, Naval Weapons Station, Concord, California, Naval Ordnance Environmental Health Center, Cincinnati, Ohio.

Tasto, Bob, 1982, personal communication, California Department of Fish and Game, Menlo Park, California.

Thompson, Dick, 1982, personal communication, Assistant Manager, Feather River Hatchery, Oroville, California.

United States Fish and Wildlife Service, 1981, Pacific Coast Ecological Inventory.

United States Fish and Wildlife Service and California Department of Fish and Game, 1979, Protection and Restoration of San Francisco Bay Fish and Wildlife Habitat.

Woodward-Clyde Consultants, September 1975, Geotechnical Investigation for Vehicular Overpass Naval Weapons Station, Port Chicago, California, Oakland, California.

APPENDIX A

PLANT AND ANIMAL SPECIES IN THE NWS CONCORD AREA

Table A-1

BIRD SPECIES OBSERVED IN THE
CONTRA COSTA COUNTY AREA

Common Name	Scientific Name	Number Observed
Mallard duck	Anas platyrhynchos*	2
Cinnamon teal	Anas cyanoptera*	8
Ring-necked duck	Aythya collaris	2
Turkey vulture	Cathartes aura	2
White-tailed kite	Cathartes aura	2
Marsh hawk	Circus cyaneus*	3
Red-tailed hawk	Buteo jamaicensis*	1
American kestrel	Falco femoralis*	1
Ring-necked pheasant	Phasianus colchicus*	4
Snowy egret	Leucophoyx thula	1
American bittern	Botaurus lentiginosus*	5
Sora rail	Porzana carolina*	1
American coot	Fulica americana*	20
Killdeer	Charadrius vociferus*	1
Ring billed gull	Larus delawarensis	2
Mourning dove	Zenaidura macroura*	8
Common flicker	Colaptes cafer*	2
Barn swallow	Hirundo rustica	15
Cliff swallow	Petrochelidon pyrrhonota	5
Violet green swallow	Tachycineta thalassina	20
Tree swallow	Iridoprocne bicolor*	2
Common crow	Corvus cryptoleucus	4
Long-billed marsh wren	Telmatodytes palustris*	20
Mockingbird	Mimus polyglottos*	8
Golden crowned kinglet	Regulus satrapa	2
Water pipit	Anthus spinoletta	60
Loggerhead shrike	Lanius ludovicianus*	1
Orange crown warbler	Vermivora celata*	2
Yellow-rumped warbler	Dendroica coronata, audubon*	200
Yellow throat warbler	Dendroica dominica*	25
Western meadow lark	Sturnella neglicat*	20
Red-winged blackbird	Agelaius phoeniceus*	6
Brewer blackbird	Euphagus cyanocephalus*	4
American goldfinch	Spinus tristis*	8
Savannah sparrow	Passerculus sandwichensis	35
Dark eyed junco	Junco oreganus	10
White crowned sparrow	Zonotrichia leucophrys*	80
Golden crowned sparrow	Zonotrichia atricopilla	10
Lincoln sparrow	Melospiza lincolnii*	1
Song sparrow	Melospiza melodia*	100
Rufous-sided towhee	Pipilo erythrophthalmus*	4

*Possibly breeding on site

Source: Natural Resources Conservation Award Report WPNSTA Concord, March 1980.

Table A-2

MAMMALS OBSERVED OR SUSPECTED OF BEING
PRESENT IN THE CONTRA COSTA COUNTY AREA

Common Name	Scientific Name	Number Observed
Common opossum	Didelphis marsupialis	Possibly
Ornate shrew	Sorex ornatus	Observed
California myotis bat	Myotis californicus	Observed
Black-tailed hare	Lepus californicus	Observed
Desert cottontail	Sylviloqus audubonii	Observed
Beechey ground squirrel	Otospermophilus bacheyi	Observed
Botta pocket gopher	Thomomys bottae	Possibly
Beaver	Costor cinalensis	Possibly
Western harvest mouse	Reithrodontomys megalotis	Possibly
Deer mouse	Peromyscus moniculatus	Possibly
Dusky-footed wood rat	Neotoma fuscipes	Possibly
California meadow mouse	Microtus californicus	Observed
Muskrat	Ondatra zibethian	Observed
Norway rat	Rattus norvegicus	Observed
House mouse	Mus musculus	Observed
Gray fox	Urocycon cinercoargentus	Observed
Coyote	Canis latrans	Observed
Raccoon	Procyon lotor	Observed
Long-tailed weasel	Mustela frenate	Observed
Spotted skunk	Spilogale putorius	Possibly
Striped skunk	Mephitis mephitis	Observed
River otter	Lutra canadensis	Observed
House cat	Felis domesticus	Observed

Source: Natural Resources Conservation Award Report WPNSTA Concord, March 1980.

Table A-3

BENTHIC INVERTEBRATES
IDENTIFIED AT NWS CONCORD

Phylum	Genus, Species
Annelida	
	Oligochaeta sp.
	Neanthes succinea
	Streblospio benedicti
	Polydora uncata
Anthropoda	
	Corophium spinicorne
	Protis californica
	Pontharpinia obtusidens
	Leptochelina sp.
	Corophium acherusieum
	Synidotea laticauda
	Corophium insidiosum
	Balanus sp.
Mollusca	
	Corbicula cluminea
	Macoma inconspicua
	Mya arenaria
	Petricola pholadiformis

Source: Navy, Department of, Naval Facilities Engineering Command, Western Division, Environmental Assessment, Ammunition Pier [Containers] CONVERT Pier 2, First INCR [P-161] NWS Concord.

Table A-4

ZOOPLANKTON
IDENTIFIED AT NWS CONCORD

Phylum	Class, Order	Genus, Species
Annelida		
	Class Polycheata - Larvae	
Anthropoda		
	Class Cirripede - Nauplii	
	Order Calanoida	
		Acartia clausi
		Eurytemora affinis
	Class Malacostraca	
	Order Amphipoda	
	Order Mysidacea	
		Neomysis awatschensis
	Order Decapoda	
Brachiopoda		
	Order Cladocera	
Chordata		
	Fish eggs	

Source: Navy, Department of, Naval Facilities Engineering Command, Western Division, Environmental Assessment, Ammunition Pier [Containers] CONVERT Pier 2, First INCR [P-161] NWS Concord.

Table A-5

FISH SPECIES IDENTIFIED IN WATER
ADJACENT TO NWS CONCORD

Common Name	Scientific Name
Freshwater	
Carp	Cyprinus carpio
Goldfish	Carassius auratus
Sacramento blackfish	Orthodon microlepidotus
Sacramento squawfish	Ptychocheilus grandis
Splittail	Pogonichthys macrolepidotus
Sacramento western sucker	Catostomus occidentalis
White catfish	Ictalus catus
Black crappie	Pomoxis nigromaculatas
Bluegill	Lepomis macrochirus
Tule perch	Hysterocarpus traski
Prickly sculpin	Cottus asper
Western sucker	Catostomus occidentalis
Brown bullhead	Ictalurus nebulosus
Hitch	Lavinia exilicauda
Anadromous	
Pacific lamprey	Entosphenus tridentatus
White sturgeon	Acipenser transmontanus
Green sturgeon	Acipenser medirostris
American shad	Alosa sapidissima
King salmon	Oncorhynchus tshawytsha
Steelhead trout	Salmo Gairdneri
Striped bass	Roccus saxatilis
Euryhaline	
Threadfin shad	Dorosomo petenense
Delta smelt	Hypomesus transpacificus
Threespine stickleback	Gasterosteus aculeatus

Source: Natural Resources Conservation Award Report WPNSTA Concord, March 1980.

Table A-6

FLORA FOUND IN CONTRA COSTA COUNTY

Common Name	Scientific Name	Vegetation Type
Figwort family	Scrophularia	5
Sea purslane	Sesuvium verrucosum	2, 4
Blue dicks	Brodiaea pulchella	4
Milkweed	Ascelepias vestita	5
Fiddleneck	Amsinckia douglasiana	2, 5
Fiddleneck	Amsinckia lycopsoides	2, 5
Heliotrope	Heliotropium curvassium var. oculatum	2
Common chickweed	Stellaria media	2
Parish's glasswort/ pickleweed	Salicornia subterminalis	4
Russian thistle	Salsoa hali var. tenufolia	5
Western ragweed	Ambrosia psilostachya	5
Mayweed	Anthemis cotula*	2, 5
Yellow star thistle	Centurea solstitialis	2, 5
Common thistle	Cirsium vulgare	5
Cotton-batting	Gnaphalium chilense	2, 5
Prickly lettuce	Lactuca serricola	2, 5
Pineapple weed	Matricaria matricaroides	2
Sunflower	Monolopia major	5
Bristly ox-tongue	Picrus echoides	2, 5
Common groundsel	Senecio vulgaris	2, 5
Milk thistle	Silybum marianum	2, 5
Oyster plant	Tragopogan porrifolius	2
Cockle bur	Xanthium strumarium var. canadense	5
Bindweed	Convulvulus arvensis	2
Hedgebind weed	Convolvulus sepium	2, 5
Mustard	Barbera vulgaris	2, 5
Chinese/Indian mustard	Brassica juncea	2, 5
Black mustard	Brassica nigra	2, 5
Charlocks	Brassica kaber	2, 5
Shepard's purse	Capsella bursa-pastoris	2
Prostate hutchinsia	Hutchinsia procumbens	5
Common/Bog rush	Juncus effusus var. pacificus	4
Common horehound	Marrubium vulgare	2
Birds-foot trefoil	Lotus corniculatus*	2
Lupine	Lupinus bicolor	2
Lupine	Lupinus succulentus	2
Bur clover	Medicago hispida	2
White clover	Trifolium repens	2
	Trifolium spps.	2
Cheeseweed	Malva parviflora	2, 5
Common knotweed	Polygonum aviculare var. parviflora*	2

Table A-6 (Cont.)

Common Name	Scientific Name	Vegetation Type
Curly dock	Rumex crispus	2, 5
Red maids	Calandria ciliata	2
Miners lettuce	Montia perfoliata var. parviflora*	2
Miners lettuce	Montia spathulata	2
Cottonwood	Populus fremontii	5
Goodding's willow	Salix gooddingii	5
Valley willow	Salix handsiana	5
Arroyo willow	Salix lasiolepia	5
Owl's clover	Orthocerpus purpurescens	2
Cattail	Typha angustifolia	4
Coyote thistle	Eryngium vaseyi	5
Sweet fenel	Foeniculum vulgare*	2, 5
Small or swart nettle	Utrica urens	5

Key to vegetation type:

1. Upland grassland
2. Lowland grassland
3. River levees-swale
4. Freshwater marsh
   a. Seasonal
   b. Permanent
5. Delta riparian

*Plants seasonally common to the area but not identified during the study period

Source: Natural Resources Conservation Award Report WPNSTA Concord, March 1980.